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# *Lessons of the birds*

Howard Marsh, D.D.





CLINICAL MANUALS  
FOR  
PRACTITIONERS AND STUDENTS  
OF MEDICINE.

2162





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A KNEE-JOINT AFFECTED WITH CHARCOT'S DISEASE.

HOWARD HARRIS, F.R.C.S.

PROFESSOR OF SURGERY IN THE UNIVERSITY OF CALIFORNIA  
AT BERKELEY AND SURGEON GENERAL, MARINE HOSPITAL, AT THE ARMY, SAN  
FRANCISCO, AND IN THE MARINE HOSPITAL, SAN  
JUAN, P.R.

WITH 14 ILLUSTRATIONS AND A COLORED PLATE.





# DISEASES OF THE JOINTS.

B1

HOWARD MARSH, F.R.C.S.,

SENIOR ASSISTANT SURGEON TO, AND LECTURER ON ANATOMY AT,  
ST. BARTHOLOMEW'S HOSPITAL; SENIOR SURGEON TO THE HOSPITAL FOR  
SICK CHILDREN, AND TO THE ALEXANDRA HOSPITAL FOR  
HIP DISEASE.

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WITH 64 ILLUSTRATIONS AND A COLOURED PLATE.

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PHILADELPHIA:

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1886

To

SIR JAMES PAGET, BART., F.R.S.

SERJEANT SURGEON TO THE QUEEN, ETC. ETC.

MY MASTER IN SURGERY FOR MORE THAN TWENTY YEARS,

MY EXAMPLE IN ALL THE HIGHEST RULES OF CONDUCT,

MY EVER KIND FRIEND AND READY ADVISER,

I DEDICATE THIS BOOK WITH THE DEEPEST

GRATITUDE, AFFECTION, AND RESPECT.

YSA 991 3941

M36  
1886

To

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## PREFACE.

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SURGERY has now reached a stage of development in which every department presents itself from many points of view. It is, therefore, even when dealing with only a single branch, impossible within reasonable limits to be exhaustive, and in the following work I have been obliged to confine myself mainly to a description of the diagnosis and treatment of Diseases of the Joints. Pathology must always form the basis of Surgery; but Pathology has of late undergone such a rapid advance that it demands a special course of study in the Museum and Post-mortem Room. It cannot be adequately set forth in such a treatise as the present, which is intended for the use of practitioners and students of Clinical Surgery. Most of the chapters, however, contain a brief reference to the pathology of the affections to which they relate. For this part of the work I am very largely indebted to Mr. Bowlby, Surgical Pathologist to St. Bartholomew's Hospital, who, while placing his extensive knowledge freely at my disposal, has allowed me to adapt his descriptions to the space which, in nearly every instance, I

feel has been too limited to do justice to his views. I only hope that in the process of abbreviation I have not misrepresented his opinions.

In keeping the work within the prescribed limits I have found it necessary to omit a reference to many authors both in Europe and America, of whose contributions I have repeatedly availed myself. I have felt it, however, better to express my own conclusions than to offer a mere compilation which could afford but a very imperfect reflection of the views of other Surgeons.

My best thanks are due to my colleagues at St. Bartholomew's Hospital and the Hospital for Sick Children, for permission to make use of cases that have been under their care.

30, *Bruton Street, Berkeley Square.*

*October, 1886.*

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# DISEASES OF JOINTS.

## CHAPTER I.

### INTRODUCTORY REMARKS.

To any one interested in the study of diseases of the joints it is natural to inquire whether, in the last thirty or forty years, an amount of progress has taken place in this department at all commensurate with that which has been reached in other branches of surgery. I shall endeavour to show that this question admits of a satisfactory answer, by alluding briefly to some of the chief improvements that have been introduced. One important result of such a review, however, will be to emphasise the fact that all surgery is one; that the same general principles are common to every department; that any advance in one part tells on every other part; and that he will best succeed in the diagnosis and the treatment of diseases of the joints who has gained the clearest insight into the laws which regulate practice in other sections of the common whole.

It was in 1850 that Brodie published the last edition of his book on "Diseases of the Joints," a work which gave to the study of this important, but previously little cultivated subject, an impetus, the effect of which has been felt down to the present time, and is still far from being exhausted. Since that day our knowledge has been largely increased by the study of surgical pathology, especially in the department of microscopic anatomy. The changes that occur in the synovial membrane, the ligaments, the

articular cartilage, and the periarticular tissues, have been defined and explained, the morbid anatomy of many diseases has been worked out, and the opinions founded on clinical observation and inference have been examined from the independent standpoint of pathological research in such cases, among many others, as tuberculosis, syphilitic disease, and morbid growths involving the synovial membrane and adjacent soft structures. The appointment of Demonstrators of surgical pathology in the medical schools has ensured the same critical study of surgical cases in the post-mortem room as was formerly bestowed on medical cases only, and the exhibition of rare forms of disease at the various societies and their examination by special committees have been productive of a wide diffusion of accurate information.

Another great advance has been in the direction of diagnosis, a department which has been largely indebted to the cultivation of correct diagnosis in other divisions of surgery. We can scarcely realise the time when limbs were amputated for "neuralgia," sometimes due, as Brodie, in one of his happiest discoveries, taught us, to a condition so easily dealt with as circumscribed abscess in the end of one of the bones. Since Brodie's day syphilitic diseases of the joints have been recognised, and the connection between certain affections of the joints and lesions of the nervous system has been pointed out; among the most interesting examples of which, besides Charcot's disease, are the cases lately described by Mr. Bowlby\* of ankylosis of the joints of the fingers following division of the nerves of the fore-arm. Since Brodie's day, also, the effect of disease commencing in the epiphyses, in giving rise, by extension, to affections of the joints in childhood, together with the necessity of

\* Surgical Registrar and Demonstrator of Surgical Pathology at St. Bartholomew's Hospital.

treatment before the articulation itself is reached, has been clearly described ; so again, owing to the observations of Sir W. Jenner and Dr. Wickham Legg, have the joint affections met with in the course of hæmophilia.

In the field of treatment, the influence of rest in staying the progress of disease in its early period, so emphatically taught by Brodie, Hilton, and Sir James Paget, has met with gradually increasing recognition, and the fact has now been fully established that scrofulous affections of the joints, when persistently treated from their commencement by this method, very seldom reach a formidable stage, and generally end in recovery with very slight impairment of the limb. The development of the antiseptic treatment of wounds, so largely due to the labours which must perpetuate the name of Lister in the annals of surgery, has produced results which can scarcely be exaggerated in the management of suppuration in joint disease. It is now well known that matter, whether connected with acute or chronic arthritis, may be safely evacuated, with the result that the severe suffering, the prolonged fever, the wide and destructive burrowing, and the formation of sinuses which were the common rule only a few years ago, can be generally avoided. These results are more far-reaching than at first sight they appear to be ; for when disease can thus be checked at its outset, and when, should suppuration occur, the complications formerly so constantly met with in connection with large collections of matter can be averted, diseases of the joints become in their whole aspect much less formidable, they extend over much shorter periods, they lead to no material deformity, they cause comparatively little suffering, they inflict but little injury on the general health, while such mutilations as excision and amputation are falling more and more into disuse.



The removal of loose bodies from the joints, an operation which in Brodie's time was frequently fatal, is now, when carefully performed, attended with scarcely an appreciable risk. In many cases, again, osteotomy is employed for the correction of deformity, both with safety and with great advantage to the patient.

The introduction of anæsthetics into general use in surgery has led to an important improvement in the treatment of joints that have been left stiff after injury of the surrounding soft parts, or as the result of inflammation occurring in connection with fracture of the ends of the bones. For when gas or ether has been given, and all muscular resistance is thus abolished, adhesions can be ruptured by the use of an amount of force which is so slight that no risk whatever is incurred to either the blood-vessels or any of the other structures of the limb. The practice of using manipulation for the purpose of relieving pain and restoring motion in carefully selected cases is, I am convinced, one of the greatest advances that have lately been made in the department of minor surgery.

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## CHAPTER II.

### SYNOVITIS AND ARTHRITIS.

**Simple synovitis.**—By simple synovitis is understood an inflammation of the synovial membrane, which is not dependent upon any constitutional disorder or cachexia, and is not set up by any disease of the contiguous structures.

Simple synovitis is conveniently divided into (1) acute, (2) subacute, (3) chronic.

1. **Acute synovitis.**—The most common cause of acute synovitis is injury; many cases arise from

exposure to cold and wet ; in addition, there are not a few instances in which no definite cause can be assigned.

The changes that take place in the synovial membrane are in all respects similar to those that are met with in inflammation of any of the connective tissues. The membrane becomes intensely vascular, and assumes a bright red tinge, which appears at first sight to be uniform, but on closer inspection is seen to be due to the presence of an innumerable collection of turgid blood-vessels. Later on, the surface presents here and there patches of blood extravasation, each indicating the site at which a hyper-distended vessel has relieved itself by yielding an exit to some of its contents. The appearance of the synovial membrane in this stage is very striking, for its bright red colouring is set off by the pearly white of the articular cartilage. Very soon after the vascularity commences, the membrane rapidly swells and becomes soft, succulent, and juicy. The swelling is greatest in the situations of the normal folds, where the membrane passes from one articular surface to another, and by the swelling in these situations the edges of the cartilages are encroached upon and overlapped to a greater or less extent.

Microscopically examined, the changes that are seen correspond with those already described as visible to the naked eye.

The blood-vessels dilate, fresh capillaries are formed, the blood stream is at first accelerated, but soon stasis in many places ensues. Exudation occurs into the perivascular spaces, and these become softened and distended by the excess of serous fluid with which they are soaked. Leucocytes escape from the distended capillaries, and multiply and collect in the soft connective tissue beneath the endothelium, then penetrate between the endothelial cells and reach the

internal surface of the joint. Here and there a vessel gives way and allows the escape of its contained blood. In many cases the fibrin-forming elements do not leave the vessels, and the fluid exudation is simply serous; but in cases of greater intensity a plastic exudation takes place, and, the fibrin coagulating in the subserous tissue, the inflammation assumes a plastic character.

The endothelial cells also take part in the general cellular activity. They multiply with more than usual rapidity, and in many cases are cast loose into the joint before they have discharged their contents. When the multiplication of cells is rapid none of them attain their full size and development before they are displaced to make way for fresh cells, which are constantly being pushed to the surface from below.

**Changes in the synovial fluid.** — The changes in the synovial fluid are in proportion to those which occur in the membrane itself.

At first the fluid is simply increased in amount, but very rapidly the synovial secretion becomes diluted with the products of inflammation, so that the joint is distended with a mixture of synovia and serum; at first this fluid is quite clear, but as the inflammation progresses flakes of fibrin make their appearance, and in many cases a membranous layer is deposited upon the synovial surface, giving it an opalescent or cloudy hue.

Mingled with this fibrinous exudation are the cast-off endothelial cells, and the leucocytes which have penetrated to the joint cavity; these cells are not always to be distinguished from one another, but the endothelial cells are, at any rate in the earlier stages, much the larger, and contain many nuclei.

In all acute inflammations the synovial fluid is coloured to a greater or less extent by extravasated



blood, and red blood corpuscles are found on microscopic examination.

As to its physical characters, synovial fluid, from a case of acute synovitis, is red, sticky, or viscid, and opalescent.

It should be mentioned that, in case of injury, a definite extravasation of blood is not infrequent at the time of the accident. In most cases this effused blood is rapidly mingled with synovial fluid and serum, and does not clot for some time, if at all.

If a simple acute synovitis undergoes resolution, the cell proliferation ceases, the exudation fluid is absorbed, the newly formed vessels shrink and disappear, the softened and infiltrated tissues resume their natural appearance, and the membrane and its secretion again present an entirely normal appearance.

2. **Subacute synovitis.**—Subacute synovitis is due to the same causes which induce the acute variety. In its course it presents no material points of difference from the latter, all the changes being less marked and of lower intensity, but otherwise identical.

3. **Chronic synovitis.**—Chronic synovitis may be originally induced either by injury or by exposure to cold and wet; frequently, however, it is the result of an acute or subacute inflammation of the synovial membrane which has not entirely cleared up.

In many cases of acute synovitis the distension of the capsule is so great that unless much care is exercised in the after-treatment of the affected joint the tendency is for the effusion to remain for an indefinite time.

The appearance of the synovial membrane when acute synovitis is merging into the chronic form, is but little altered from the normal, the only marked change being that, on account of the excess of fluid in which it is bathed, the membrane is swollen and succulent.

Microscopically, there is seen to be some cell

exudation, but this is at all times slight. There is generally some increase of vascularity, though this is never a marked condition. As time goes on further changes may ensue, and the synovial membrane may become thickened and indurated by the gradual formation in its substance of fibrous tissue developed from the cells already mentioned. In the majority of cases, however, recovery will finally result.

The changes that occur in the synovial fluid in chronic synovitis are not of a very marked nature. It is greatly increased in amount, but is diluted by large quantities of serum; there is little or no cell exudation, the fluid is not opalescent, and no fibrinous coagula such as are met with in acute synovitis are present. The fluid generally contains albumen in considerable quantity. As its name implies, the process is a chronic inflammation of the synovial membrane, and the gradual thickening of tissue, and the increase of fluid, are changes analogous to those which occur in other chronically inflamed parts; *e.g.* in bursæ.

**Simple purulent synovitis.**—In certain severe cases of acute inflammation of the synovial membrane, the exudation cells or leucocytes collect in such numbers as to cause the synovial secretion to become milky in colour, and, later on, the fluid in the joint cavity is almost pure pus. The appearance of the synovial membrane does not at first differ materially from that already described as typical of acute serous synovitis; and indeed, in most cases, the pus in the joint comes rather from the *surface* than from the deeper parts of the membrane, the cartilage, ligaments, and bones not supplying pus in any large amount. It is in this *superficial* character of the suppuration that the chief pathological difference between "simple purulent synovitis" and "acute suppurative arthritis" (page 13) is to be found.

**Symptoms.**—Acute serous synovitis is met with

in a characteristic form after contusion or over-exertion. The patient is attacked with pain in the joint. At first only moderate, this rapidly becomes severe, especially at night, and is of a tense, bursting character. The joint, placed in the posture of "greatest ease," becomes fixed in this position, and any attempt at movement causes severe suffering. Swelling varies as to its amount, but is usually considerable. It takes the general shape of the joint, the synovial cavity of which becomes distended, and in the superficial articulation clearly marked out. Bulging, however, is most distinct where the capsule is thin, in the intervals between the tendons and ligamentous expansions which traverse the surface. Heat is a very important symptom in the case of the elbow, wrist, knee, and ankle; it is not, however, available in the instances of the shoulder and hip, as these joints are so thickly covered in with soft parts. Heat may be gauged by comparing the temperature of the suspected joint with that of its fellow, under similar conditions of exposure, either by placing the flat hand on the surface, or by the more exact method of using the surface-thermometer. In slight cases an increase of temperature may be the most distinct evidence that synovitis is present; while, on the other hand, if a joint is perfectly cool, this circumstance is of itself enough to show that no inflammatory action is in progress. Redness of the superjacent skin is present in severe cases, but it is often slight, and may be entirely absent. Tenderness is frequently so great that the weight of the bed clothes or the slightest pressure cannot be borne. Fluctuation, when effusion has taken place, is readily detected through the joint in various directions. Muscular atrophy is sometimes observed even in the first few days, and within three weeks it may have become very marked.

In subacute synovitis the symptoms are similar to



those just described, though they are less distinctly marked. They are increased by exercise. Especially is this the case with swelling, surface heat, and stiffness. Movement is usually much restricted.

Chronic synovitis is accompanied in some instances by the additional symptom of a large increase of effusion into the joint cavity, so that the case presents the features of hydrarthrosis; in others, considerable thickening of the synovial membrane takes place; in others, again, a creaking sensation on movement, similar to that felt when the sheaths of tendons are inflamed, may be felt.

The prognosis in cases of serous synovitis must vary with the origin, and degree of acuteness, of the disease. When the affection is due to injury in a person of sound health, though it may be tedious, and apt to relapse, it usually at length ends in recovery. Suppuration, though sometimes met with, is very unusual.

*Treatment of acute synovitis.*—The first and most important point always to be very carefully borne in mind, is to place the limb in good position, and to maintain it at complete rest by means of some comfortable appliance. (*See the various joints under their respective headings.*) When attacked with inflammation the joints are instinctively placed in the position of "greatest ease:" when the shoulder is affected, the arm remains at the side; the elbow, wrist, and knee are fixed at an angle of  $120^{\circ}$  to  $140^{\circ}$ ; the ankle is slightly extended; the hip is flexed, abducted, and slightly rotated outwards. These positions must be so far amended that the limb is brought into such a posture that it may still be useful should the joint become permanently fixed. This change must be very gently effected, and to accomplish it, it may be advisable, both in order to save pain and to secure muscular relaxation, to employ an anæsthetic, especially in the case of children. In some

instances, however, it is better not to make any immediate attempt to alter the position of the limb, but to enclose it in well-fitting splints in the posture to which the disease has brought it. For, with a few days' rest, muscular rigidity will pass off, and the limb can easily be placed, or will naturally subside into a good position.

It may be enough to support the elbow and wrist in a leather or poroplastic splint and a sling; but whenever one of the larger joints is acutely inflamed it is best, in addition to the use of splints, to keep the patient in a horizontal position. With a few days of complete rest the acute inflammation will subside, while otherwise it is apt to run on, and may even lead to suppuration. As the patient lies in bed the limb should be thoroughly supported. To relieve hyperæmia, and thus reduce tension and pain, a piece of lint large enough to cover the joint is kept constantly wet with an evaporating lotion, or irrigation may be effected by allowing water, at a low temperature, to flow through a skein of darning cotton at a suitable rate from a vessel suspended close above the limb, or the joint may be covered with Leiter's tubes, through which a stream of iced water constantly runs; or a bladder of ice may be suspended so that its pressure is not a source of distress. When synovitis is very acute, or sudden in its onset in a strong person, ten or twelve leeches may be applied with advantage. When the synovial membrane has been rendered tense by rapid effusion, many surgeons recommend that the joint should be aspirated. This operation cannot be spoken of as devoid of risk, yet there is no doubt that it has often been attended, though the amount of fluid drawn off has been only two or three teaspoonfuls, with very marked relief.

The general treatment consists in the use of an aperient, and subsequently, if vascular disturbance



is marked, of tincture of aconite cautiously given in doses of one minim every half-hour, or every hour, or of the salicylate of soda in ten to twenty-grain doses every six or eight hours, till the pulse and temperature have been reduced. Pain must be relieved by morphia, either in the form of a draught or of a hypodermic injection, or from five to ten grains of Dover's powder may be given at bed time, or more often if required. The patient should be kept at first on a diet principally of milk, soup, or broth, and farinaceous foods, and neither stimulants nor meat should be allowed.

*Treatment of subacute and chronic synovitis.*—Here, as in the acute form, the first indication is to secure complete rest. The joint must be enclosed in some form of well-fitting splint. (*See* under the various joints.) Blisters are very serviceable. They should be used in succession at intervals of three or four days, one healing before the next is applied. In obstinate cases they should be continued in a series for two or three weeks. Either the *emplastrum cantharidis* may be applied, or the *liquor epispasticus* (generally the most convenient form) may be painted on the surface. If tincture of iodine is used, it must be put on daily, or often enough to create sharp irritation of the skin. When fluid remains in any quantity after the blisters it may often be got rid of by uniform pressure, best obtained by Martin's elastic rubber bandage, which, however, must be very carefully adjusted; or the joint may be covered with either the *unguentum hydrargyri compositum* (Scott's ointment), with the *unguentum hydrargyri*, or with an ointment of *oleate of mercury*, five or six grains to the ounce, spread on lint, and be then strapped with narrow pieces of soap plaister, and over this the elastic bandage may be applied.

The period during which rest is necessary varies in different cases, but it must be continued as

long as there is either heat or pain in the joint, or while either of these symptoms, or any increase of stiffness is produced by exercise. As recovery advances the joint may be douched with hot salt water, and gently rubbed with stimulating liniments, *e.g.* with equal parts of *linimentum saponis* and *linimentum camphoræ*; and passive movements, slight at first, and gradually increased, may be used; but they must be closely watched, and discontinued if either pain or heat that does not quickly subside, or increased stiffness, is observed. The highly important question of endeavouring to restore movement in joints that have been inflamed is described at page 225 *et seq.*

**Acute suppurative arthritis.**—By acute suppurative arthritis is meant a general inflammation of the structures which enter into the formation of a joint, attended with the development of pus. This formidable condition may be produced in various ways.

1. By injury. The most common cause is a wound (incised, punctured, or otherwise) which opens the articular cavity and allows the entrance of septic agents. An injury, however, which does not at first open the joint may subsequently do so by the sloughing of the soft tissues to which it leads.

2. By the spread of inflammation from surrounding parts, especially from the neighbouring bones, in consequence of either epiphysitis (page 125), acute periostitis, or chronic abscess of bone bursting into the joint.

3. As the result of such affections as pyæmia, septicæmia, puerperal fever, various zymotic diseases, scarlet fever, typhoid, etc., and, though very rarely, gonorrhœa. (*See index.*)

The changes that occur in acute suppuration of a joint are tolerably uniform, however the affection has been brought about. The chief differences observed depend on the rapidity and severity of the inflammation.

In a simple case, caused, for example, by a punctured wound, through which infecting material has found entrance, the synovial membrane is the tissue most evidently affected in the early stage. This becomes so vascular that it assumes a bright red colour, swells, and presents a soft, succulent, and gelatinous appearance on section. The endothelial surface is dull, and opalescent; it gradually loses its smooth, polished aspect, and becomes covered with shreds of fibrine; subsequently it passes into a condition resembling



Fig. 1.—Ulceration of Cartilage, exposing the subjacent Bone. (From a preparation in the Museum of St. Bartholomew's Hospital.)

granulation tissue. The synovial fluid is increased in quantity, and rapidly becomes opalescent from admixture of flakes of fibrine. Very shortly it acquires a milky appearance, from the presence of pus cells, and finally it assumes a distinctly purulent consistence, and in the more acute cases is often blood-stained, as the result of minute hæmorrhages from the intensely injected synovial membrane.

The cartilages lose their pearly-white colour, and appear of a bluish tint. Soon they become permeated with blood-vessels, and ulcerated in patches, exposing



the subjacent bone. Here and there flakes of cartilage undergo necrosis, and are cast off loose into the articular cavity. The ligaments, softened and infiltrated with serum and pus, become weakened and stretched, and soon completely give way, so that the joint surfaces undergo displacement. The articular ends of the bones are, like the other structures, inflamed, and become carious, and more or less extensively destroyed by ulceration. The periarticular tissues share in the general inflammation. Abscesses rapidly form in them, and frequently, from the first, communicate with the cavity of the joint. These collections of pus are often very large, and tend to burrow widely among the surrounding muscles, so as to make their way, when *e.g.* the knee is the joint affected, both upwards in the thigh and downwards in the leg for a considerable distance. Suppuration in cases of acute arthritis is profuse, and the tendency of matter to track its way in the soft parts rather than to approach the surface is a marked and important feature.

Microscopically examined, the different structures of the joint show changes typical of acute inflammation in connective tissue. All alike are infiltrated with leucocytes, and are rapidly destroyed by those agents. Cell proliferation is rapid and abundant. The endothelial lining of the joint is replaced by clusters of cells, arranged in the form of papillæ, and often forming true granulation tissue. The cartilage cells multiply, and, together with the leucocytes poured out from the newly formed blood-vessels, collect in masses, and break up the normal hyaline matrix into longitudinal bundles. These collections of cells, increasing in size, reach the joint surface, and are discharged into the articular cavity. In the bones, the cell exudation takes place into the Haversian canals and the canaliculi, the walls of which are absorbed.

The osseous structure becomes rarefied, and the enlarged spaces are found filled with a highly vascular granulation tissue.

The progress of a case of acute suppurative arthritis, unless energetic treatment is at once adopted, is generally from bad to worse, and (when a large joint is affected) the patient succumbs either to exhaustion, consequent on traumatic fever, or to some form of blood poisoning. When adequate treatment is adopted sufficiently early, life may generally be preserved, provided the patient is not already exhausted by the action of some grave constitutional disorder, such as one of the specific fevers. As far as the joint is concerned, the usual result, when recovery ensues, is the formation of bony or close fibrous ankylosis. This is brought about as follows. The intensity of the inflammatory process subsides, and the production and multiplication of cells become limited; while the cells which remain in the various structures, whether bone, ligament, cartilage, or synovial membrane, become gradually developed into fibrous tissue, in which, where it is in contact with osseous tissue, bone salts are subsequently deposited. The new blood-vessels shrink and disappear, the fibrous tissue, which is not ossified, contracts, and the joint, as such, ceases to exist, its cavity being entirely obliterated. In instances, however, in which treatment is adopted early, and in which the bones have not become exposed and carious, a more or less movable joint is left. While should the secreting surface of the synovial membrane not have been destroyed, and should the cartilage and ligaments be yet intact, the patient may preserve a useful and movable articulation, although some thickening and weakness remain.

*Symptoms.*—In a typical case, the knee being the example selected, a few hours after the injury the joint is the seat of pain, which soon becomes

exceedingly severe, especially on any attempt at movement, and of quickly augmented swelling. The temperature rises to  $102^{\circ}$  or  $104^{\circ}$ ; the pulse to 110 or 120, and the patient feels ill and depressed. Sometimes a distinct rigor occurs. Very soon the joint is distended, exquisitely tender, and covered with a distinct flush. Constitutional disturbance is very marked, the temperature remains high, rigors perhaps are repeated, the patient loses his appetite, and can obtain no sleep unless sedatives are given. In the course of two or three days the occurrence of suppuration is indicated by increased constitutional disturbance, and general illness and weakness, a further rise of the temperature and pulse, increased pain and tension of the joint, a deeper flush on the surface, and by cedema of the surrounding soft parts, often involving the limb for a considerable distance above and below the joint. Should the case be allowed to take its course the local mischief increases, matter bursts through the distended joint capsule, and is extravasated through the limb; the patient rapidly wastes, and becomes feeble and prostrate; the tongue is dry and brown, delirium comes on, and death occurs by exhaustion, perhaps accelerated by general blood poisoning.

*Treatment.*—On the slightest suspicion that acute suppurative arthritis is about to set in, the joint must be immediately placed (for every hour is of importance) on a splint which maintains it at absolute rest, and which will be convenient for the treatment that may be necessary when suppuration has taken place. Thus the knee should be arranged on a back splint, with interrupted side splints, and be swung beneath a cradle. The attempt to treat these cases without a splint, by supporting the limb on a pillow, may be confidently expected to end in disaster. The joint should be covered with cold evaporating lotion, or with an ice bag suspended so as not to press on the



joint. The question of using leeches is important. I have seen many cases in which, in the early stage, leeches appeared very useful. In a strong adult eight or ten may well be applied. One minim of tincture of aconite, repeated every quarter or half-hour, according to the method introduced by Sydney Ringer,\* should be given, the effect on the heart's action being carefully watched; or five to ten minims of the *vinum antimonialis* every six hours for two or three days may be prescribed. The diet should be non-stimulating but nutritious, consisting of fluids, *i.e.* milk, beef-tea, etc. If the joint becomes much enlarged, and the seat of fluctuation, it should be aspirated, a fine needle being used, and strict antiseptic precautions being taken. The removal of tension not only relieves pain, but, by diminishing irritation, is not without effect in arresting impending suppuration. As soon as it is suspected (from increased swelling not only of the joint but of the surrounding soft parts, the presence of œdema, and pitting of the surface on pressure, and more pronounced redness of the skin, together with an increase of pain and of general illness, and a further rise of temperature) that matter has formed, an exploratory puncture should be made with a large-sized hypodermic syringe, and if pus is discovered, the articulation must be at once freely opened (every possible care against septic infection being taken) and drained, and the wound dressed with antiseptic gauze. There can be no doubt that the destructive changes so often met with in acute arthritis are considerably checked by the early evacuation of matter, and the provision for adequate drainage. The safety of these means, however, must be provided for by the joint having been placed at complete rest, and by all septic agents having been excluded. I have seen in past years several instances in which, insufficient caution having been adopted, violent

\* Brunton's "Therapeutics," p. 296.

and destructive inflammation has ensued when the joint was opened, with the result that the patient has died of irritative fever and exhaustion. After matter has been let out the case often takes a favourable turn ; pain diminishes, suppuration declines, the temperature falls, the general health improves, and at last recovery, usually with ankylosis, takes place. Should the progress of the case, however, be unfavourable, so that the joint has evidently become disorganised, and matter has burrowed widely in the limb, the question of performing amputation must be considered. The danger is that this proceeding may be so long delayed that the patient has become too weak to bear it. The operation should not be postponed if, while the joint is the seat of profuse suppuration, the general health is giving way, and the patient, with high temperature, and loss of appetite and sleep, is daily losing flesh and strength. The effect of the amputation is often most marked. There is an immediate improvement in every respect, and convalescence rapidly advances.

But in some instances, when the arthritis has resulted from puerperal, or one of the specific fevers, or from general blood poisoning, or when the patient is suffering from serious organic disease, especially of the kidneys, or from diabetes, the danger of leaving the joint is usually less than that incurred by amputation, and the operation must, therefore, not be ventured upon till all the features of the case have been fully taken into account. It may be best to wait, in the hope that careful nursing and management will secure an opportunity at a later date for amputation under more favourable circumstances. In a case of acute arthritis, should blood poisoning (always a probable result) become established, the treatment to be pursued is that described at page 28.

The following case of suppurative arthritis illustrates many of the characters of this formidable disease.



A pale, delicate-looking girl, aged 16, was admitted into St. Bartholomew's Hospital in September, 1885, under the care of Mr. Cripps. On the morning of the 19th of September she woke with great pain in the vicinity of the left knee, but was able to take a long walk. In the evening she felt very ill. Her condition growing daily worse, she was brought to the hospital on the 24th. Her temperature was high, and she was in a very feeble condition. The knee was swollen, hot, and extremely painful, and evidently contained fluid, the leg and thigh were œdematous, and there was considerable thickening around the lower end of the femur. On the 25th free incisions were made into the joint, and a large amount of purulent synovial fluid was evacuated. During the next two weeks there was profuse discharge and a persistently high temperature; and then vomiting and rigors set in. On October 17th amputation was performed at the junction of the lower with the middle third of the thigh. In spite of pyæmic inflammation of other joints and in the parotid region, the patient made a good recovery. An examination of the amputated limb showed extensive necrosis of the lower third of the femur on its posterior surface, which was entirely denuded of periosteum. The synovial membrane was of a bright red tint, and contrasted strongly with the pearly white appearance of those portions of the articular cartilage which still remained. The cartilage was, however, in great part destroyed, while portions of it hung as loose shreds upon the subjacent carious bone. The ligaments were, for the most part, destroyed by ulceration.

**Acute suppurative arthritis following diffuse periostitis.**—Acute suppurative arthritis of a very severe and destructive type is not rare in the course of that form of acute suppurative periostitis which is apt to be followed by acute necrosis of the shafts of the long bones in children and young adults.

In this affection pus quickly collects under the periosteum (which in early life is easily detached), and constitutes a large subperiosteal abscess. Thus situated, matter is usually prevented from reaching the neighbouring joint by the firm attachment of the periosteum to the epiphysial cartilage; but in some cases this barrier gives way, and, still burrowing under the membrane, pus enters the articulation, either in small quantities through a mere pin-hole orifice, when only slight synovitis may result, or much more commonly in considerable amount through a large opening, with the result that violent suppurative arthritis is at once produced. When this condition is established, there is usually but little hope that amputation can be avoided; and the necessity for this proceeding is increased, or rendered imperative, when separation of the epiphysis from the shaft of the affected bone has occurred.

*Treatment.*—The course adopted must depend upon the general condition of the patient. The joint, after being placed on a splint, must be opened and efficiently drained. If the temperature fall, and the patient is not losing ground, amputation may be postponed, in the hope that repair may take place; but if the temperature remains high, and the patient is growing weaker and thinner, the limb must be removed without delay, the bone being divided four or five inches above the epiphysial line. Even though the shaft is bare considerably above this level, the operation should still be performed not far from the joint. Very probably the bone will maintain its nutrition by means of its internal circulation, and may thus survive, the periosteum re-acquiring its attachment; while, should necrosis have taken place, the portion of shaft that is dead can subsequently be withdrawn when it has become detached, as a sequestrum. I have seen many cases in which, though the periosteum has been

completely detached for a distance of several inches from the shaft of the femur or of the other long bones, no necrosis has occurred.

For a notice of arthritis following epiphysial disease *see* page 132.

**Arthritis following the exanthemata.**—Typhoid fever, and more rarely variola, may be followed by joint disease. Often only one articulation is affected, but in other cases several are attacked. The form of disease varies. In many instances it consists of an acute or subacute synovitis; in others, of an inflammation affecting also the ligaments and articular cartilages, and resulting in considerable stiffness or even in complete ankylosis. More rarely an acute suppurative arthritis is set up. In typhoid fever the hip is of all the joints most commonly involved, the most frequent condition being an acute synovitis attended by rapid effusion into the capsule, and not rarely followed by spontaneous dislocation of the femur on the dorsum ilii. In the following case ankylosis had occurred in a position of great deformity, a result that might easily have been prevented by the timely use of weight extension, or of a Thomas's splint (page 406). Hy. P., aged 14, was admitted into St. Bartholomew's Hospital in October, 1885, with hip disease. Six months before he had suffered from typhoid fever, and this had been followed by pain in the hip and gradually increasing stiffness of the joint. On examination the right thigh was found to be flexed at an angle of  $140^{\circ}$ , and everted, and there was an inch shortening of the limb. No suppuration had occurred. There was no motion at the joint, and forcible attempts under an anæsthetic failed to improve the position of the limb. Mr. Willett, therefore, performed osteotomy below the great trochanter, and placed the limb in a good position. The boy made a favourable recovery and left the hospital



able to walk on the limb, at the end of about nine weeks.

The arthritis that occurs after scarlet fever is prone to affect many joints. It may be briefly said to induce changes which closely resemble either those met with in acute rheumatism, or more rarely such as occur in osteo-arthritis, and to be attended with the same results as are observed in the latter disease. Occasionally, however, the joint affection is the outcome of a clearly marked pyæmia. Mumps, dysentery, and measles may be followed by similar inflammation of the joints. Suppuration is not common, and when it occurs it is usually confined to a single articulation.

Regarding the precise nature of the joint affections which are met with in association with the specific fevers, different opinions are entertained. Some authorities consider that they are provoked by the presence of micro-organisms, some by a specific poison circulating in the blood, and some by absorption of septic materia from some centre of infection established in the course of the primary disease. The last is the view that I am inclined to hold. But the point is one regarding which there must for the present be considerable doubt.

**Urethral arthritis (gonorrhœal rheumatism, gonorrhœal synovitis).—**It is well known that arthritis, sometimes of a severe type, may be developed in the course of either gonorrhœa or simple purulent urethritis, such as is, for instance, occasionally provoked by the use of catheters, or by contact with secretions in which no gonorrhœal element is present. In this condition (for which urethral arthritis is a better name than either of the old terms gonorrhœal rheumatism or gonorrhœal arthritis) frequently only one joint, and that a large one, is attacked. The knee most often suffers, but no joint is exempt. Even those of the fingers and of

the spine may be involved. The disease is not rarely symmetrical. A very troublesome form is that which sometimes invades the ankle and contiguous tarsal joints, and in which the inflammatory process extends itself to the fibrous structures of the sole, and leads to an aggravated degree of flat foot.\*

The disease, which in its clinical features resembles rheumatic synovitis, may be acute, and may even, though this is rare, pass on to suppuration and complete disorganisation of the joint, necessitating amputation. Indeed, cases running the course of ordinary pyæmia and ending fatally have been recorded. Generally, however, it is subacute at the outset, and subsequently passes into a chronic and very tedious form. The inflammatory process is attended with plastic exudation rather than with copious effusion, and the articular tissues, as well as the ligaments, may be the seat of changes, accompanied by the organisation of new fibrous tissue. In such cases permanent stiffening, often combined with considerable deformity, and depending on lesions resembling those met with in osteo-arthritis, may be the result. Bony ankylosis, though it may occur, is rare. Much more commonly the joint is rendered completely fixed by close fibrous union between the articular surfaces. A man, aged 26, was under my care at St. Bartholomew's Hospital in 1885, whose right knee had become flexed at an angle of about  $110^{\circ}$ , and stiff, after gonorrhœa contracted nine months previously. Movement could not be detected till he was under the influence of ether, and then it was scarcely perceptible. As the knee could not otherwise be straightened, I performed excision. During the operation the patella was found to be united by fibrous tissue to the condyles of the femur, and the tibia and femur were joined by firm fibrous ankylosis. The cavity of the articulation was

\* St. Barth. Hosp. Reports, vol. xviii. p. 34.

entirely obliterated. Urethral arthritis may occur either within a few days of the commencement of the discharge, or be delayed till only a slight gleet remains. The attack may be preceded by an increase of the discharge; often, however, no change in this respect is observed, while sometimes discharge is considerably diminished or entirely arrested. The affection is attended with the same pain, heat, and moderate swelling, and marked with the same periods of remission and exacerbation that are met with in ordinary rheumatism. When several of the large joints are invaded the patient may be much crippled, and instances have been met with in which, in the course of repeated attacks, almost every joint in the body has become fixed. The disease is rare; that is to say, its percentage among cases of gonorrhœa is very small. Though occasionally met with in the female subject in association with gonorrhœa, and also with purulent discharge from the vagina of simple character, it is almost confined to the male sex. It is a remarkable fact that in some individuals this form of arthritis occurs with every attack of gonorrhœa that is contracted. Sir Astley Cooper and many other writers have described examples of this kind. The affection appears to be most common in gouty and rheumatic subjects.

The nature of this affection is still a matter of some uncertainty. Some severe cases are doubtless instances of pyæmia or septicæmia. The milder forms are probably due to the absorption of some *materies morbi*, which proves itself especially noxious to the joints. The theory lately advocated by Dr. William Ord and other observers (that the disease is the result of reflex nerve disturbance), although there is considerable evidence in its favour, cannot at present be said to have been fully worked out.

*Diagnosis.*—It is very important not to overlook



the fact that arthritis depends on gonorrhœal or other form of urethral discharge, for the treatment of the original malady is a necessary step in the management of the secondary affection. The danger is that urethral arthritis may be mistaken for an attack of ordinary rheumatism. Error can only be avoided by remembering the possibility that inflammation either of a single joint, or of several, resembling rheumatism, and coming on without obvious cause, may depend on urethral mischief, and by ascertaining whether any discharge is present.

*Treatment.*—This always presents two main points; the arrest of the urethral discharge, and the management of the affected joint. For the former the reader should consult some good authority on venereal disease, such as Hutchinson, Berkeley Hill, or Bumstead, whose works contain full directions for the treatment of all the stages of urethral discharge. As to the joint, this must be kept at complete rest, and if there is increased heat or pain, an evaporating lotion or an ice-bag should at first be employed. A succession of blisters, about two inches square, should be then applied at intervals of three or four days, or as they severally heal. Subsequently, any swelling that remains may be reduced by an indiarubber bandage. At a still later stage, the hot douche, or hot vapour bath, combined with shampooing and friction, will be useful; or the joint may be strapped with the *unguentum hydrargyri* or with the *unguentum hydrargyri compositum*, and covered with an indiarubber bandage. Sometimes the salicylate of soda in the acute stage, or in the chronic stage iodide of potassium, or sodium (page 157) will be beneficial. Iron or quinine should be ordered if the patient is anæmic; while if he is gouty, the remedies mentioned at page 40 will be required. In cases in which the joint has become fixed, the adhesions must, when all inflammatory action has ceased, be cautiously

broken down while the patient is under the influence of ether; and daily passive movements, with hot fomentations or the vapour bath, must be perseveringly employed, provided no swelling and heat that do not soon subside are produced. The result of this treatment will depend upon the case. When the adhesions are fortunately in the main outside the joint, motion will be restored, but when synovitis has been followed by fibrous adhesions within the articular cavity, although free movement is produced at the time, stiffness will show a strong tendency to recur (chap. xvii.).

**Pyæmic arthritis.**—Inflammations of the joints are of common occurrence in pyæmia. In acute cases the tendency is for many articulations to be affected in rapid succession so that in two or three days several may be attacked, while in the more chronic cases several become involved, though at longer intervals. The most common form of arthritis in pyæmia is a synovitis characterised by the rapid development of a considerable collection of pus, unattended, however, by the pathological signs which are usually met with in acute inflammation. In post-mortem examination of the joints in pyæmia there is found no material reddening or swelling of the synovial membrane, and the cartilage, ligaments, and the ends of the bones when they have been washed, present no abnormal appearance. The articular cavity is filled with pus which is of a distinctly yellow colour, or of a red tint from admixture of blood, and which is thin, flaky, or curdy in consistence, and sometimes very fetid. Mixed with the pus is a varying amount of synovia.

The course of a case of pyæmic arthritis is very variable, and cannot safely be predicted. In many instances the patient dies before any further structural change has taken place. Should life be prolonged, the whole of the fluid in the joint may be absorbed, and the articulation may entirely recover. Sometimes, however,



considerable stiffness remains from the presence of fibrous adhesions, and frequently the joint becomes firmly ankylosed. In other instances the capsule of the joint gives way and a large collection of pus forms in the periarticular structures, and burrows widely in the surrounding soft parts and in the intermuscular spaces, and though the mischief advances very insidiously, the joint is rapidly destroyed. Should the abscess burst externally, the joint becomes the seat of more active inflammatory changes, identical with those described under the head of acute suppurative arthritis (page 13). It is remarkable that while in some cases of pyæmia the stress of the disease falls mainly on the joints, in other instances the joints entirely escape.

*Symptoms.*—Attacked with pyæmic arthritis, the joint becomes, often in a few hours, considerably distended, and the seat of obvious fluctuation. The swelling is usually flaccid rather than firm and tense, the outline of the synovial membrane is distinctly mapped out, and the fluid in the joint conveys the sensation of being near the surface. The skin is either natural in appearance, or presents a faint blush, often limited to some part of the surface. There is in many instances so little pain at first, that the condition of the joint may escape notice. In some cases absorption may take place, as already said, and the joint may recover either entirely, or with only a slight remaining stiffness. In others the swelling increases, pus becomes widely extravasated into the surrounding parts, the ends of the bones, owing to destruction of the ligaments, undergo displacement, and disorganisation of the joint becomes complete.

*Treatment.*—Owing, in the less acute cases, to the large amount of effusion which takes place, and in the more severe cases to the rapid disorganisation of the joint, there is a strong tendency to the displacement of the ends of the bones. This is especially the case in

the hip, the knee, and the wrist. In the hip complete dislocation of the femur on the dorsum ilii is very apt to occur. Moreover, in the advanced stage pain becomes very severe, especially on movement of the joint. It is necessary, therefore, that the limb should be at once supported and kept at rest on a well-fitting splint. The hip is best treated by weight extension, and with sand-bags passing along the inner and outer sides of the limb. Should the joint become distended, matter should be drawn off with the aspirator, great care being taken to prevent the entrance of any septic agent. Aspiration is advisable. It tends to avert the extravasation and subsequent burrowing of matter in the periarticular structures and in the intermuscular spaces of the limb; while if pus is left, as its fluid parts undergo absorption its fibrine remains to induce anchylosis.

Should matter rapidly re-collect, the aspirator may be used again; but should matter have escaped from the joint into the neighbouring structures, free incision and drainage will be required. If mischief advances, and it is found that the joint is destroyed and there is no prospect of anchylosis, the question of amputation will arise.

The propriety of this operation must be determined by a full consideration of all the facts of each particular case. Usually it is inadmissible, owing to the general condition of the patient. If, however, while the symptoms of constitutional disturbance are declining, and while the general strength is maintained, the joint is a source of pain and exhausting discharge, and there is no other serious local affection, amputation may be performed.

#### **Puerperal inflammation of the joints.—**

Puerperal fever, or as it is now more commonly termed, puerperal septicæmia, is a variety of blood poisoning due to absorption of septic material from the uterus;

and the form of joint disease met with in association with it accords with that which is developed in the progress of ordinary pyæmia.

As in other instances of pyæmic infection, so it is here, that both in the severity of the general symptoms and in the degree in which the joints suffer, great differences present themselves. Sometimes the pyæmic attack is acute, and rapidly destroys life, many joints are involved, and become quickly disorganised, and even the articular ends of the bones may be necrosed. On other occasions, pyæmic infection is of slight intensity, and the joint affection runs a mild though a prolonged course, and ends in firm fibrous ankylosis. Often only the knee is attacked. The affection does not call for any detailed description. All the main points concerning it, and the treatment required, are alluded to under the head of pyæmia. I need only add that the interior of the uterus must be maintained as far as possible in a healthy condition, so that no further absorption of septic material may occur; a weak solution of iodine, one part of the tincture in two or three hundred parts of water, being perhaps the best and safest injection that can be employed for this purpose. With this or some other disinfectant, the uterus should be irrigated twice or three times a day.

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## CHAPTER III.

### GOUT.

GOUT is a constitutional malady, in which the joints tend to become attacked by a form of inflammation associated with the deposit of urate of soda. These gouty inflammations may be either acute or chronic;

they are generally chronic, with acute and severe exacerbations.

The changes that take place in the articulations are briefly as follows : In any acute attack, the synovial membrane presents appearances identical with



Fig. 2.—Irregular Deposit of Urate of Soda on the Condyles of the Femur and on the Patella.

those of acute synovitis, and the synovial fluid is similarly altered in character and consistency.

The cartilages become inflamed, their matrix fibrillates, and their cells multiply. In the substance of the cartilage and upon its free surface, a remarkable white deposit, consisting of urate of soda, occurs either irregularly or as a uniform layer. (*See Figs. 2 and 3.*) Gradually the diseased cartilage becomes eroded and



worn away, so that the articular ends of the bones are exposed. These, in turn, become the seat of inflammatory changes, with a similar deposit of urate of soda (Fig. 4). The ligaments, synovial membrane, periarticular connective tissues, and bursæ, all become the seat of similar changes, and in some cases bony



Fig. 3.—Deposit of Urate of Soda, in a smooth, uniform layer, on the Articular Cartilage of (A) the Astragalus, and (B) the lower end of the Tibia. (From a preparation in St. Bartholomew's Hospital Museum.)

ankylosis may ensue (Billroth). The diseased joints become stiff and painful, so that even when no true ankylosis has occurred, only slight mobility is present. But little need here be said as to the pathology of gout. By most authors the original departure from the normal condition is held to be an increase of uric acid in the blood, and, in respect to the joints, it is supposed that this is simply deposited from the blood,

combined with soda, in the form of urate, and by its presence induces the inflammations typical of gout.

There can be little doubt that in gout there is a generally unstable condition of the tissues, that an excessive amount of waste is continually occurring, and that these waste products accumulate in the blood in the form of uric acid. It is, however, quite possible that the urate of soda found in the joints is produced *in loco*, and is not brought to the articulations from a distance. For, contrary to the stated



Fig. 4.—Section of a Great Toe, showing Deposit of Urate of Soda in the Bones and surrounding soft parts. The phalanx is in great part destroyed. (From a preparation in St. Bartholomew's Hospital Museum.)

opinions of many authors, it is a fact, Mr. Bowlby informs me, that, in a very large proportion of cases of gout, examined *post mortem*, the cartilages are eroded and fibrillated, and it is in such cartilages that urate of soda is most likely to be found. Further, the gouty deposit occurs, Mr. Bowlby has observed, rather in the more central than in the peripheral parts of the affected cartilage, and it seems, on the whole, highly probable that some at least of the urate of soda is formed in the cartilage itself, and that it tends to remain in the part simply because there are no blood-vessels to convey it away, as there are in the more vascular tissues. Such a theory finds support in the commonly acknowledged fact that it is in

non-vascular tissues, such as tendons, fasciæ, etc., that gouty deposit is found when it occurs in parts other than the articulations.

There is no space here for a full clinical description of gout, and the account now to be given will have reference mainly to the disease as it affects the joints. It occurs in two chief forms: the acute and the chronic, connected with each other by numerous intermediate examples. The following is a typical case of the acute variety: A patient, who has gone to bed, as he believes, in his usual health, or who has perhaps suffered for a few days with loss of appetite, flatulence, heartburn, and slight nausea, or other signs of dyspepsia, is awakened two or three hours after midnight with an uneasy sensation or sharp pain in the metatarso-pharyngeal joint, or ball, of the great toe, accompanied with a feeling of chilliness, or even by a distinct rigor, soon succeeded by heat and perspiration. The pain increases until it is almost unbearable, and is of a grinding, wrenching, or burning character, as if a hot iron were being forced into the joint. According to Sir Thomas Watson, a humorous Frenchman thus described its intensity: "Place your joint in a vice, and screw the vice up until you can bear it no longer; that may represent rheumatism. Then give the vice another twist, and you will obtain a notion of gout." The toe is exquisitely sensitive, so that the patient cannot bear the weight of the clothes upon it, or even the jar of a heavy footstep in the room; and, while he is unable to keep the limb in one position, every movement tends to increase his suffering. The whole toe becomes stiff, swollen, hot, and suffused with a bright red, or sometimes with a more dusky tint; the veins in the surrounding skin are distended and prominent, and the subcutaneous tissue is œdematous, and pits on pressure. To hang the foot down at once

produces an agonising feeling of tension or bursting. After a few hours the swelling increases, the pain moderates, and the day is passed in less distress; but at night the attack renews itself in all its first intensity, and the patient feels feverish, restless, and miserable. Towards morning, however, perspiration comes on, and he falls asleep; and when he awakes he finds that the symptoms of local inflammation have considerably moderated, and he is able to move, and bear pressure on, the joint. These phenomena of subsidence during the day, and exacerbation at night, continue for two or three days or more, and then pass off, and are followed by desquamation of the cuticle, attended with troublesome itching. Suppuration, though it may occur, is extremely rare.

Left to itself, the attack lasts for a week or ten days, sometimes even for three weeks, but when adequate treatment is adopted, it usually subsides within three or four days. Although the ball of the great toe is the most common seat of a first attack, the original seizure may involve any of the other articulations. As the affection declines in one joint, it is very likely to appear in some other, often in the corresponding joint of the opposite foot, or in a knee or an ankle, where it runs much the same course as that just described, although it is generally less severe and of shorter duration. All the joints, including those of the toes and fingers, are liable to attack, but the hip and shoulder usually escape. In patients of weak health, especially in women, gout assumes an asthenic character, and the pain, heat, redness, and swelling are much less marked. In these cases, however, the affection is apt to be very tedious, and the joints are often left in a weak and crippled state. At first, a joint, when the gouty attack has subsided, regains its former strength and mobility, but when it has been several times affected, it is liable to considerable permanent



must take the following points into consideration : The presence or absence of gout in the parents, or other blood relations of the patient ; the patient's age (gout is very rare before puberty, and does not usually occur before the age of thirty-five or forty ; it is common through all the later periods of life, up to very old age) ; the fact that the disease is much more common in the male sex than in women, in whom it is rare after menstruation has ceased. A full meat diet, combined with a free use of malt liquors or wine, especially when little exercise is taken, strongly promotes gout, while the inability to assimilate beer or wine may often in itself be a sign of the disease. The nature of any previous attack, or of the present seizure if it be the first, must be considered, suggestive points being the sudden onset, affecting most frequently the ball of the great toe, the intensity and paroxysmal character of the pain, the exquisite tenderness of the surface, a cutaneous blush, œdema, distended veins, nocturnal exacerbations, slight constitutional disturbance, and the fact, often to be elicited, that previous and similar attacks have been separated by intervals of good health. It should be observed whether there are any deposits of urate of soda in the ears, in the fingers, or in any of the various bursæ. The urine should be examined for albumen, which is often present in chronic gout. Great caution, however, in forming a diagnosis is required. Sir James Paget has recorded a case in which, after the ligature of hæmorrhoids, acute inflammation of the great toe joint, dependent on pyæmia, was at first ascribed to acute gout. Dr. Garrod mentions a similar case, and points out that the constitutional disturbance was from the first much greater than is met with in gout.

In his "*Clinical Lectures and Essays*," which it was my good fortune to edit, Sir James Paget, in

his chapter on gout in some of its surgical relations, points out the following as minor signs of the disease:

*In the hands and feet.*—Darting and aching pains, and stiffness in the knuckles, especially after faults of diet, or when the patient wakes in the morning; burning palms or soles, pain and tenderness of the substance of the heel, or in the tendo Achillis, which may be thickened; numbness and tingling of one or more of the fingers or toes. The knuckles are enlarged, flattened, or spheroidal and stiffish; and the skin over them is smooth, glossy, and often tense and warm. Later on, the joints become more deformed, and the metacarpus and fingers are everted, the fingers are sloped downwards, and towards the ulnar side of the hand. Often over the finger joints there is either a subcutaneous bursa, or a thickening of the connective tissue, forming a disfiguring lump; or a little cyst may form over a finger or a toe joint, filled with a pellucid, yellowish, tenacious fluid. Many gouty persons have thickening and contraction of the palmar, or more rarely of the plantar fascia, which becomes seamed and knotted, and tends, as it contracts, to draw down the fingers towards the palm. The ring-finger and little finger are those most usually affected. (This condition constitutes one of the forms of "Dupuytren's contraction.")

*In the mouth and pharynx.*—Attacks of pain and tenderness of the teeth, which become very sensitive to pressure, and feel as if they were raised out of their sockets and slightly loose; psoriasis of the tongue, very like syphilitic psoriasis, in the form of bald purple, or opaque white patches of thickened epithelium, like snail tracks. Other minor signs in the tongue are burning and aching, or neuralgia, alarming people with fears of cancer. The uvula is often elongated, and a source of troublesome coughing, or even of retching. Some gouty persons suffer from chronic pharyngitis, in which all the mucous

membrane covering the pharynx and pillars of the fauces is smooth, thickened, œdematous, glossy, and dull-coloured; others from pain in the palate, as if in some part of a single muscle, provoked by swallowing, and often shifting its place, or there may be a sensation of tickling in one small spot, as if a crumb were irritating the part. *In the digestive organs:* Gouty persons are often flatulent and bilious, and many things disagree with them. Even small quantities of beer or wine produce burning in the soles and pain in the knuckles. Minor signs of gout in the *urinary organs* are the presence of urates and uric acid in the urine; and cystitis, leading to intense irritability of the bladder, and painful burning on passage of the urine, which contains mucus or pus, and, though very rarely, blood; heat along the urethra, and sometimes a thin purulent discharge. These bladder attacks often come on suddenly in the night, and as if by metastasis, as gouty symptoms elsewhere subside. Persistent gleet, with increase of discharge during attacks of acidity, is often largely dependent on gout, as is herpes or eczema about the glans, often recurring, and producing a bright red, florid, and shining surface. So, again, is the frequent occurrence of erections, unassociated with sexual feeling, and especially troublesome during attacks of acidity or indigestion.

In the *nervous system* gouty persons are subject to various neuralgiæ, sciatic, lumbar, etc., sudden, fitful and provoked by indigestion. Neuralgia of the heel, external ear, tongue, palate, fingers, and breast, is often gouty. So are burnings, numbnesses, and tinglings in various parts of the surface; or the fingers and toes often "die" and become white, and then flush and are hot; or there is numbness of a limb, as if it were asleep; or there are pins and needles. Cramps, especially in the legs and feet at night, are frequent; so are catching of the muscles, with sudden



feeling of stiffness and pain after too long exercise. These are felt in the neck as sudden cricks, or in the loin, and are often followed by stiff neck or lumbago lasting several days. In gouty persons the *skin* is liable to eczema, psoriasis, and urticaria, and is very susceptible to irritation. The eruption, of whatever kind, comes out suddenly and without apparent cause, or often after some known error of diet ; or by metastasis of gouty inflammation from some other part. Eczema is the most frequent, and often leads, by weakening the skin, to varicose veins, and to the gouty eczematous ulcer.

**The treatment of acute articular gout** must be (*a*) local, and (*b*) general. (*a*) Position is very important. The joint must be placed in a posture favourable to the return of venous blood. When the knee or ankle is affected, the limb must be kept in a raised position. When the elbow is attacked, the arm must be supported in a sling. When the wrist is involved, the fore-arm should be supported on a well-padded splint, circular constriction above being carefully avoided. Though the acute character of the inflammatory process seems to suggest the local abstraction of blood by leeches, authorities are very generally opposed to this method, on the ground that experience has shown that local depletion appears to favour the deposit of urate of soda in the tissues, with the result that the ligaments become rigid, and the joints stiffened or even ankylosed. Dr. Garrod says : " I can with confidence warn those engaged in the treatment of acutely inflamed gouty joints never to resort to this mode of combating the disease." When the pain is only moderate, the joint should be covered with soft flannel, or a thin layer of dry cotton wool, kept in place with a silk handkerchief, or with oiled silk, or a lotion containing one grain of atropine, eight grains of the hydrochlorate of morphia, and two

drachms of spirit in an ounce of water may be applied on lint covered with oiled silk. Sometimes a solution of bicarbonate of soda, a drachm to the ounce, applied warm, gives relief; or either a mixture of belladonna and opium, or a lotion of lead and opium, may be used. A lotion of lithia, five grains to the ounce, is a useful solvent to chalk stones, exposed by ulceration of the skin. A similar lotion may be applied to stiff, gouty joints. In chronic gout the local treatment to be adopted is that which is described in the chapter on chronic rheumatism.

(b) The general treatment is best commenced by the administration of an aperient, either in the form of ten grains of the compound colocynth, or colocynth and hyoseyamus pill, followed, if necessary, by a draught containing two drachms of the sulphate of magnesia, ten grains of the carbonate, and a drachm of tincture of cardamoms in an ounce and a half of water, or two drachms of sulphate of magnesia and a drachm of tincture of senna. Should the liver be sluggish, a pill containing three grains of grey powder, or two grains of calomel may be given; or an ounce to three ounces of the Hunyadi János water is a very good aperient in these cases. The question whether colchicum should be given is an important one. This drug has undoubtedly a powerful influence on the disease, and its effect is often almost like magic. After two or three doses the attack begins to subside, and soon entirely disappears. Colchicum, however, is apt to produce sickness and purging, accompanied with depression of the action of the heart, and great general prostration. It must, therefore, be always cautiously given, and its effect must be carefully watched; while in weakly persons, or in those in whom it has, when given for a previous attack, produced unfavourable symptoms, it is best not to resort to it. It appears to be most valuable when given to robust patients

suffering from acute gout. Yet it is often of great use in the chronic forms of the disease. The belief entertained by many observers, that the effects of the drug depend more on the idiosyncrasy of the patient than on the acute or chronic nature of the disease, is probably to a great extent correct. In practice, the best course, when the attack is either acute or prolonged, is, unless the drug has already been found to disagree, to prescribe colchicum in moderate doses, and to discontinue it if unpleasant symptoms are produced. The preparations most in favour are the *tinctura colchici seminum*, which may be given in doses of from ten to twenty-five minims, or the acetous extract, of which the dose is from one to two grains, every six hours. Often in subacute gout, a pill containing one grain of this extract may be usefully given each night at bedtime. Vascular disturbance is often moderated by the tincture of aconite, given in from five minim doses every four or six hours, or in doses of one minim every hour (page 18). Its effects on the pulse must be carefully watched. The salts of lithia are held in high repute, and owe their efficacy to the fact that urates of lithia are more soluble than those of either potash or soda. Either from three to six grains of the carbonate, or from five to ten grains of the citrate (the latter salt is to be preferred) may be given twice or three times a day in potash water, or in a draught with ten grains of citrate of potash: or a tumbler of *liquor lithiæ effervescens* may be given twice or three times a day. Alkalies, in the form either of the bicarbonate or the citrate of potash (fifteen grains of the one or twenty of the other) every six hours, are necessary to correct acidity, and to aid in the elimination of the urates and of uric acid. In cases of asthenic gout, in which the patient is pale and feeble, quinine or the compound tincture of bark is beneficial, while some authorities recommend these



drugs even in the acute stage of the sthenic form of the disease. Guaiacum, formerly much in use, has of late years fallen into disrepute, and is now seldom given, though in obstinate cases in which other remedies have failed it may be worthy of trial.

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## CHAPTER IV.

### RHEUMATIC SYNOVITIS.

THE subject of acute rheumatism, or rheumatic fever, belongs rather to the province of the physician than of the surgeon. But considering that joints affected by this variety of inflammation may require surgical treatment, it is necessary to describe very briefly the changes to which they are liable.

In the great majority of cases these changes are similar to those which are found in cases of simple synovitis already described, and the usual result is a complete restoration of the articulation to its former healthy condition.

In acute rheumatism there is, however, a tendency for the inflammation to affect other structures than the synovial membrane; thus the subsynovial and the periarticular tissues are not uncommonly the seat of inflammatory exudation. The cartilages in severe cases present a bluish or opalescent tint, and may, in places, become distinctly swollen; microscopically examined, they are found to be the seat of cell proliferation and exudation, and in a few instances they become fibrillated or eroded. Further, the inflammation may extend to the bones and ligaments, and, in rare instances, suppurative inflammation of the joint may occur. The characters of the synovial fluid in cases of acute rheumatism necessarily vary with the

intensity of the inflammation, and with the structures that are involved. In general terms the fluid may be said to resemble that of simple synovitis, but it contains much more fibrine, and is consequently shreddy.

Although, as already said, most cases of rheumatic fever recover without any permanent lesion of the joints, it will readily be understood that where the cartilages or ligaments and surrounding connective tissues have been involved in the inflammatory change, more or less stiffening may result; and in some cases a genuine fibrous ankylosis leaves the articulation permanently fixed.

The ordinary duration of synovitis in any individual joint in a case of acute rheumatism varies from about three or four days to a fortnight, but in instances in which the deeper structures are implicated the course of the inflammation frequently drifts on into a subacute or chronic stage; and whilst the other articulations have become quite sound and painless, the affected joint (for rarely more than one is so affected) remains swollen and painful. The essential tendency of subacute or chronic rheumatic inflammation of a joint is towards the organisation of the inflammatory products into connective tissue, and not to simple cell proliferation and the formation of pus. It thus happens that in protracted cases much thickening of the capsular and other ligaments, of the synovial membrane, and of the periarticular tissues results, and it is to this thickening and to the contraction of the newly formed fibrous tissue that the subsequent stiffness is due.

In the following case, although no suppuration occurred, ankylosis took place.

J. B., æt. 21, was admitted into St. Bartholomew's Hospital under the care of Dr. Southey, on July 31st, 1881, suffering from acute rheumatism. The wrist joints and the left shoulder were swollen

and painful. Endocarditis was present. The temperature varied from  $99^{\circ}$  to  $103.2^{\circ}$ , and the left elbow and knee joints subsequently became implicated. The patient was treated with salicylate of soda, and after a fortnight all the joints except the left knee were free from pain. The left knee, however, became more swollen and more painful, and was much distended with fluid. It was painted with iodine and wrapped in cotton wool, but continued, nevertheless, to get worse. It was now treated by blisters and a back splint, and by September 14th the swelling and pain had subsided; but much pulpy thickening remained, and the leg was slightly displaced backwards. The joint was now fixed in a plaster-of-Paris splint, and finally, after some months, all pain passed away; but the joint was ankylosed in an extended position.

In very rare instances the joint disease may progress to suppuration. This is most likely to take place when the patient is tuberculous. If recovery takes place, true bony ankylosis must be generally expected, although repair with a movable joint may occur.

*Symptoms.*—As an example of acute articular rheumatism, the case may be taken of a patient who, after being exposed to cold, or to cold and fatigue, has a chill or distinct rigor, followed by a rise of temperature to  $100^{\circ}$  or  $102^{\circ}$ , or even more, accompanied by copious acid perspiration, and who a few hours later is seized with severe pain in one or more of the large joints, attended with rapid swelling, and often a distinct flush upon the surface, and with such tenderness over the joint that he is unable to bear the slightest pressure, or even the weight of the bed clothes. The pain is most severe at night, is subject to marked exacerbations, and is increased to an agony on movement of the limb. Frequently some other joint, especially the corresponding articulation of the opposite side, is soon



affected, while in severe cases many are attacked. The duration of the affection in any particular joint varies from a few hours to three weeks or more. Its erratic character is one of the most marked features of this disease. Often, in a joint that is hot, swollen, red, and intensely painful, all the symptoms rapidly subside, and in a few hours every trace of the affection has disappeared, while at the same time some other joint has, with equal suddenness, become involved. The articulations most apt to be affected are the knee, shoulder, and elbow, but none are exempt; and even the small joints of the hand and foot are often attacked. In many instances, when several joints have been involved, the majority recover, while in one or more the disease maintains a pertinacious hold, and runs on into the chronic form.

The *diagnosis* between acute rheumatism and gout may be arrived at by bearing in mind that rheumatism may occur at any age from infancy onwards, while gout is most common between the ages of forty and sixty; that rheumatism is attended by high temperature and considerable constitutional disturbance, while in gout the temperature is but little raised, and the general health but little affected; in rheumatism pain is less severe, less intermittent, and less paroxysmal than in gout; in the majority of cases the first attack of acute gout is in the great toe. In chronic gout, also, deposits of urate of soda may often be detected in the finger joints, the ears, and in other parts.

*Treatment.*—Much of the patient's suffering is due to the fact that the weight of the limb tells upon the joint. The limb should, therefore, be placed in the position of greatest ease, and be supported with pillows along its whole length. Great relief sometimes attends the application of splints to the joint, as recommended by Dr. Bridges in the St. Bartholomew's Hospital

**Reports.\*** The best material is poroplastic felt, cut out to a paper pattern, softened in hot water, and well padded with an even and thick layer of cotton wool. It should be applied on the surface on which the joint is resting, and be retained by a lightly applied bandage above and below the joint. The joint may be either wrapped in a thick layer of cotton wool; or hot poppy fomentations, lead and opium lotion, belladonna liniment sprinkled on lint, or a solution of atropine and morphia may be used. The plan of blistering the joint in the acute stage, as advised by the late Dr. Herbert Davis, sometimes gives speedy relief. Experience, no doubt, shows that the aspiration of a joint that has suddenly become tensely distended gives great relief; but the proceeding is not without risk, and had better not be ventured upon. Though this is rarely the case, the acute form of inflammation may leave the articulation permanently stiff, or with movement very considerably impaired. If, therefore, the attack is prolonged for more than a week or ten days, it will be advisable to place the joint on a splint in a position for future use in anticipation that movement may remain limited. To effect this it may be necessary, in order both to relax the muscles and to save pain, to give an anæsthetic. Should the extremely rare event of suppuration occur, the case must be treated in the manner described at page 17. In the severer forms, in consequence of rapid muscular wasting and relaxation of the ligaments in such joints as the knee, wrist, and ankle, there is a marked tendency to displacement and deformity. Should this result threaten, no time must be lost in supporting the bones that form the joint, by the accurate application of efficient splints.

**Chronic rheumatism.**—When chronic rheumatism supervenes on the acute form, the affected

\* Vol. xii. p. 175.



joints remain enlarged, hot, tender on pressure, painful, especially on movement, or when the limb is warm in bed, and so stiff and weak that the patient is unable to grasp any object, or, in the case of the lower extremity, to bear any weight on the limb. Usually several joints are affected, either together or in succession. The knees, ankles, shoulders, and wrists, and the small finger joints, are more commonly involved than the shoulder and hip. The disease is sometimes irregular in its course, changing its place from joint to joint, subsiding and relapsing, and varying in its intensity from day to day, according to the state of the weather as to temperature, wind, and damp; while sometimes one of the large joints remains affected long after the patient has otherwise completely recovered. The local signs are often accompanied with a minor degree of general fever. The affection may last for many weeks or months, and in some instances the joint never recovers its normal condition, but remains permanently stiff, weak, and painful. In another variety the disease assumes from the first a chronic and insidious form, attended with pain, stiffness, and weakness, rather than with any marked heat or swelling. Pain and stiffness are aggravated by exposure to cold, and are more marked when the joint is first moved after having been at rest. Another symptom is that of creaking, grating, or snapping of the joint on movement. As the affection advances, considerable nodulation and enlargement of the articular ends of the bones may take place, and the joints may thus become distorted and crippled. In some cases there is so much effusion into the synovial cavity of the knee or elbow joint that the disease constitutes one of the forms of hydrarthrosis.

*Treatment.*—Patients subject to chronic rheumatism should be advised to use flannel underclothing both

in warm and cold weather, so that as far as possible a uniform temperature of the skin is maintained; and to wear a knitted woollen cap or some similar covering over any joint that is affected. Fatigue should be avoided, but absolute fixation of the affected joint is not to be recommended, except in the early period of the attack, for if continued it tends to promote stiffness. Many persons find that they suffer both less pain and less inconvenience from stiffness when they keep the joint in moderate use. For local treatment the hot douche, hot bathing or fomentation night and morning, or the local vapour bath, will give most relief. A convenient apparatus for steaming the different joints may be had of any instrument maker; or, failing this, if a space is maintained round the joint by a fracture cradle or some equivalent contrivance, hot vapour may be applied by means of the ordinary croup kettle fitted with a long spout. In the later stages the joint may be shampooed after the hot bathing, and gentle passive movements may be used; while if much fluid is present, strapping with soap plaister, or the application of the elastic rubber bandage will be of service. The more obstinate cases of effusion may be treated by the methods described in the chapter on hydrarthrosis. In some instances a weak constant electric current does good, both by restoring tone to the muscles and relieving neuralgic pain. The question of forcible movement is discussed at page 228. General treatment should include the use of alkalies, in the form either of bicarbonate of potash (of which fifteen grains may be combined with an infusion of gentian, cinchona, or other vegetable tonic); or citrate of potash (of which twenty grains may be taken every morning, or twice a day in a tumbler of water); while if the patient is weak and anæmic, quinine and iron should also be prescribed.

Guaiacum is still sometimes prescribed, but it is nauseous, and of very doubtful efficacy. Yet in obstinate cases it may be worth a trial. Iodide of potassium, in doses of three to seven grains, often gives relief. This drug should be combined with the citrate or bicarbonate of potash, or be taken with some natural alkaline water. I have seen great benefit from salicylate of soda, given in ten-grain doses three times a day. Free elimination by the bowels should be maintained. Malt liquors must be forbidden, and wine, if allowed at all, must be taken in small quantities, nor must the various kinds be mixed. A small amount of whisky is the form of alcohol which is most often harmless. A damp climate is to be avoided. Great benefit often results from a residence of a month or six weeks during the summer at Buxton or Harrogate, where an atmosphere much above the level of the sea is combined with the baths, and the internal use of the waters supplied at these health resorts. (*See page 70.*) In the cool seasons of the year Bath, for the development of which as a health resort so much has lately been done, may be strongly recommended. The chief resorts on the Continent valuable in chronic rheumatism are Aix-les-Bains, Wildbad, and Baden.

## CHAPTER V.

## OSTEO-ARTHRITIS.

THE disease now to be described has received a variety of names, which the student is apt to find not a little confusing. It is true many are happily becoming obsolete, and are no longer employed in the monographs of the present time. Yet, as they are still current in the phraseology of every-day practice, it is necessary, in order to avoid uncertainty, that they should all be enumerated here. The old writers styled the affection rheumatic gout; Haygarth (1805), nodosity of the joints; Robert Adams, chronic rheumatic arthritis; Garrod, rheumatoid arthritis. The French term it *arthrite sèche*, or, after Cruvelhier, *usure des cartilages articulaires*; the Germans, *arthritis deformans*. Many recent authorities speak of it as osteo-arthritis, while that form which is limited to a single articulation has been known as mon-articular rheumatism, or, when it is seated in the hip, *morbus coxæ senilis*. So profuse an assortment of titles suggests that much doubt has existed as to the real nature of the affection. This is, in fact, the case. To assume an alliance of the disease with rheumatism, a connection which many of its names have been expressly formed to indicate, throws but little light on the subject. The superficial resemblance between many examples of this malady, and those affections which are grouped under the head of chronic rheumatism, is, as regards both their clinical features and their morbid anatomy, obvious enough. But it must be remembered that



the same symptoms and the same pathological appearances may be caused by diseases that are essentially different from each other; and also that rheumatism is a term to which no very precise meaning can be attached. Many observers anticipate that further investigation will lead to the breaking up of the disorders now ranged under the name of rheumatism into independent groups, and also that the like subdivision will be called for in dealing with the conditions hitherto classed under the term osteo-arthritis, and its synonyms. Various writers, indeed, have already drawn attention to the widely dissimilar diseases (*vide infra*) that are ranged under these phrases, and have pointed out that all the anatomical changes which have been ascribed to osteo-arthritis are found in such essentially different joint affections as urethral arthritis (page 23), the arthritis occasionally following scarlet and other specific fevers (page 23), and in hæmophilia (page 159). Thus future subdivision must occur, and as it advances, names hitherto employed will either fall into disuse, or have some definite meaning assigned to them. In the meantime, a general heading is required, and osteo-arthritis seems the best term to adopt. It involves no pathological theory, while at the same time it serves to suggest the most obvious and constant anatomical features that are met with in the different forms of disease that are included under it.

The general clinical characters of osteo-arthritis are well seen in the small joints of the fingers, or in the knee. The affected joint becomes gradually stiff, enlarged, painful, and distorted, and is found to creak or grate when it is moved. These symptoms are explained when an advanced example is dissected. It is then seen that the cartilages are worn away and that the synovial membrane is extensively diseased, so that its power of secretion is impaired



the ligaments and surrounding tendons are destroyed, and the articular ends of the bones are extensively altered in shape, and in their relations to each other.

A question that has often been discussed, is whether this remarkable affection is primarily a chronic inflammatory change, as most of its names imply, or a degenerative process to which a variable but limited degree of inflammatory action is super-added. A reference to the various groups of cases enumerated in the paragraphs that follow will show that both these views, though in different instances, are correct. The osteo-arthritis met with in old persons begins, there can be no doubt, as a purely degenerative change in the cartilage and synovial membrane, soon extending itself to the bones; and although there is added a form of inflammatory action provoked by injury inflicted on the imperfectly nourished joint structures by movement and friction, degeneration is throughout the disease the main process. On the other hand, in the cases mentioned under headings 2 and 5, (*vide infra*) and still more clearly in such instances of acute osteo-arthritis as Dr. Garrod has recorded (page 66), the affection runs a much more active course, and the increase of both vascularity and local heat, though it is not very marked, is yet distinct enough to show that the condition begins as an inflammation. Yet even in these examples *post-mortem* examination shows that a large element of degeneration is also present. A further question raised by some of the cases, especially those in group 3 (page 62), is whether the disease should be regarded as depending on irritation or disease of the central nervous system. This view has recently found many advocates, among the most authoritative being that able and laborious observer, Dr. William Ord. As to this hypothesis, it can only as yet be said that though it has much to support it, and though it

promises to throw important light on the origin of many forms of joint disease, it is at present too imperfectly worked out to call for exhaustive discussion here. It is, however, referred to at page 62.

**Morbid anatomy.** — The disease may begin either in the synovial membrane, or in the cartilage ; as a rule, it begins in the latter structure. This to the



Fig. 5.—Fibrillation of the Cartilage of the Patella in a case of Osteoarthritis. (From a preparation in the Museum of St. Bartholomew's Hospital.)

naked eye becomes rough and uneven, and here and there eroded and worn down, and its surface presents a tufted or fibrillated appearance, resembling the pile of coarse velvet (Fig. 5). In parts not exposed to pressure, and especially at its margins, the cartilage undergoes hypertrophy, and becomes heaped up in irregular nodules or ecchondroses, which subsequently undergo ossification or calcification, and thus render the articular borders prominent and "lipped" (Fig. 6). This condition is shown at a more advanced stage in Fig. 7. Sometimes these nodular masses are broken



Fig. 6.—Osteo-arthritis of the Knee Joint, showing outgrowths from the margins of the Articular Cartilage. (From a preparation in the Museum of St. Bartholomew's Hospital.)



Fig. 7.—Osteo-arthritis of the Hip Joint. (From a preparation in the Museum of St. Bartholomew's Hospital.)

off so as to form "loose bodies" in the joint (page 183). As the disease advances, the cartilage in many places, but chiefly where it is most exposed to pressure and friction, is worn away, often with the formation of deep parallel furrows and intervening ridges, while what remains is mainly broken up into a shreddy fibrous structure, intermixed with patches of calcareous degeneration. Microscopically examined, in



Fig. 8.—Fibrillation of Cartilage in Osteo-arthritis.

a section made at right angles to the free surface, the cartilage cells are found to be arranged in vertical columns (Fig. 8) and to be undergoing proliferation, so that the capsules in which they are enclosed become distended. At length the capsules burst, and the cells escape into the cavity of the joint, while the matrix between the rows of cells remains to form the longitudinal striæ and delicate fibrillated tufts already described. These, unable to resist pressure and attrition, are worn away by the movements of the joint, and



as this process of fibrillation and wearing down is repeated, the whole thickness of the cartilage is gradually destroyed. At the periphery, where the ecchondroses are found, and the articular borders become "lipped," the same proliferation of the cells and fibrillation of the matrix ensues, but as the edge of the cartilage is covered by a prolongation of the synovial membrane, the cells, instead of escaping, are retained, and undergo multiplication in the subsynovial tissue, so as to form cartilaginous outgrowths. In some cases, these ecchondroses protrude the synovial membrane in front of them, and at length project through it, so as to become intra-articular. In other instances they grow laterally, and so do not encroach upon the joint. The *synovial membrane* becomes slightly increased in vascularity, thickened, and indurated; and, as the result of hypertrophy of its fringes, and enlargement and subdivision of its villi, thickly set with shaggy and tufted, elongated or club-shaped processes (Fig. 23, page 130). As a further change, the cartilage cells (which, as pointed out by Rainey and Kölliker, the villi naturally contain) undergo hypertrophy, and are developed into cartilaginous nodules, varying from a mere speck to masses as large as a nut, or even, in some cases, as a walnut. These, when accidentally detached, constitute one of the varieties of "loose bodies" (page 181). As the affection advances to its later stages, the synovial membrane is, to a great extent, destroyed by ulceration and absorption. Some effusion of synovia, rendered cloudy, or even milky, by an admixture of disintegrated cartilage cells, usually takes place into the cavity of the joint in the early stage of the disease, but, in the majority of cases, it is very limited in amount and of viscid consistence. In some instances, however, fluid is from the first considerable, and subsequently increases, so as to constitute one of the



forms of hydrops articuli (page 76). The *bones* undergo a remarkable change, largely accounting for the peculiar features observed in this disease. As absorption and wasting of the encrusting cartilage proceeds, and the ends of the bones become exposed, the articular lamella is reached. Subject to friction, and the seat of a low form of inflammatory action, the structure is on the one hand slowly worn away, while on the other it undergoes condensation and induration, with the result that its surface is rendered dense and polished, or, as it is termed, "eburnated" or porcelanous, and studded with minute circular holes, as if "worm-eaten," an appearance due to the fact that as the bone has been rubbed down the orifices of the Haversian canals have become exposed. Beneath this porcelanous layer, the cancellous tissue involved in the chronic inflammatory action undergoes a peculiar change, in which rarefaction and atrophy are combined with new bone formation and the production of osteophytes, and nodular or tuberculous deposits, with the result that where pressure exists the articular ends become gradually flattened and worn away, while about the margins, and at such other parts as are free from pressure, large irregular plates and processes are developed. Thus *e.g.* in the hip joint, the convex head of the femur is absorbed, while its borders are surrounded by mushroom-like excrescences of new bone encroaching upon and overhanging the neck, or by thinner plates which partially ensheath it. On the other hand, the acetabulum is considerably enlarged, in a direction upwards and backwards, and rendered deep and oval, while its borders are walled in by large stalactytic formations and irregular plates. This remarkable process (in which waste and reproduction, far exceeding healthy limits, are combined) gradually leads to the complete destruction of the articulation, and to the

accumulation of new material around it, by which movement is more and more interfered with, and the limb becomes more and more weak, stiff, and crippled. This condition of things is still further promoted by the destruction of the ligaments, and by the atrophy and contraction of the surrounding muscles. The changes in the ligaments and adjacent tendons, indeed, contribute largely to this result. In the knee, for example, the crucial, as well as the external and the internal lateral ligaments, may entirely disappear, so that the joint is rendered "loose," and so weak and flail-like that it may even undergo complete spontaneous dislocation. In the later stages also the periarticular tissues are sometimes the seat of chronic œdema, which often extends into the neighbouring parts of the limb. Thus for some distance up the fore-arm, for example, when the wrist is affected, the skin becomes thin, pale, smooth, and shining, and tightly drawn over the prominences of the joint; often, again, there is effusion into the sheaths of the adjacent tendons, giving rise to multilocular gangliform swellings. (See page 175.) The absorption of tendons is best illustrated in the shoulder, where that part of the long tendon of the biceps which lies within the capsule is often found displaced from its groove and frayed out, or completely worn through, and its two ends, separated by a considerable interval, are adherent to the subjacent bone; while the tendons inserted into the tuberosities of the humerus, the subscapularis, supraspinatus, infraspinatus, and teres minor, may completely disappear. Ossification of the tendon of that head of the triceps which arises just below the glenoid cavity of the scapula, and of the tendon of the ilio-psoas, in the neighbourhood of the hip joint, may sometimes be observed. Interstitial atrophy and diminished strength of the articular extremities of the bones are illustrated by the fact that the neck of the

femur sometimes yields under the weight of the body until it forms less than a right angle with the shaft. (Usually, however, this change of shape is produced by the absorption of the original head and a great part of the neck of the bone, accompanied by the deposition of new bone on their under surface, which gradually takes their place.) The production of loose bodies in the joints, resulting from the detachment either of cartilaginous nodules from the synovial fringes, or of osteophytes from the articular margins in osteo-arthritis, is alluded to at page 181 *et seq.*

Two important and noteworthy points respecting the pathology of osteo-arthritis are, first, that suppuration, even if it ever occurs, is rare in the highest degree; and, secondly, that although movement may be entirely lost, so that the joint is fixed, this condition does not depend upon true ankylosis, which probably (the process of wearing down and loss of substance not favouring such a result) never takes place, but on the locking of the articulation by alteration in the outline of the surfaces of the component bones, the accumulation of new bone around the joint, and the wasted and contracted condition of the surrounding muscles.

Cases are sometimes met with, chiefly in the knee, in which the fluid accumulated in the interior of the joint (fluid formed of synovia rendered turbid by cell exudation and molecular debris resulting from disintegration of the cartilage and other articular structures) travels towards the surface, and there forms an opening through which it escapes, and from which it subsequently continues to drain away sometimes for several months. Though the cavity of the joint is thus opened, no active inflammation usually follows, the tissues having apparently become callous and tolerant of exposure. A man, aged fifty-two, was in St. Bartholomew's



Hospital in 1883 with osteo-arthritis of the right knee of some years' duration. The articular ends of the bones were enlarged and uneven. The joint cavity was considerably enlarged, and the synovial membrane was thickened and indurated, and here and there presented nodular masses of cartilage. On the outer side above the patella was an opening, through which an ordinary sized cedar pencil might be passed, and from which turbid synovia, varying in quantity from a few drops to two or three tea-spoonfuls a day, constantly drained away. The joint, in which creaking and grating were felt, could be moved through an arc of three or four degrees without causing pain. The patient said that the discharge had been going on for six weeks, and that at first it was much more profuse. His temperature was normal, and he had little pain. The left knee presented well-marked signs of osteo-arthritis, though only in an incipient stage.

It has been remarked above (page 52) that osteo-arthritis will probably, as pathology advances, be broken up into several minor groups that have not yet been differentiated. For the present, all that can be done is to arrange the cases that we meet with in practice under separate headings from a clinical point of view.

1. The most common form is that which is seen in persons between forty and sixty, and more commonly in women than in men.

Frequently no predisposing cause is apparent, but in many instances the affection is either hereditary, or occurs in those who have previously suffered either with gout, or acute or chronic rheumatism, or have been much exposed to cold and damp. Commencing, as a rule, in the small joints of the fingers, or in the knees, it tends gradually to spread to other articulations, till, in the more inveterate cases, all the joints, even those of the spine, are involved. In many instances, however, it remains limited to certain of

the joints (for example, to the knees, the wrists, and the elbows), while the rest escape. In these cases the patient finds the affected joints growing stiff, especially in the morning and after rest. At first the stiffness passes off as soon as the limb is moved, but it gradually increases, until motion is in great part or entirely lost. The joints creak, grate, or snap, and grow more and more weak and painful; and as the articular ends become altered in shape, irremediable and often great deformity ensues. The muscles waste and become flabby. The joints slowly enlarge and become nodular and prominent. Usually there is little or no increase of fluid; but in some instances, especially in the knee, the articular cavity becomes largely distended; or adventitious cysts are developed (page 173).

In 1885 I saw a man, aged 72, in an almshouse, who had suffered from osteo-arthritis for upwards of twenty years. Apparently not one of his joints had escaped. Many were distorted and completely fixed. His hands were so deformed and weak that he was unable to lift even a teacup without great difficulty; and his limbs were so crippled that, though he persevered in dressing himself, this process occupied him between two and three hours.

2. Another variety of the disease is that which is more common in the young or middle-aged than in the old; and in the anæmic and weakly, than in the well nourished and robust; and which is not rarely met with after the subsidence of acute articular rheumatism, or of some other acute specific disease, such as scarlet fever, measles, etc. I recently examined a military cadet, 19 years of age, who had well-marked osteo-arthritis of the fingers after an attack of fever at Malta. In women it often follows pregnancy or prolonged lactation.

3. Dr. Ord has recorded a remarkable set of cases,



in which in women near the climacteric period, ovario-uterine affections, attended with disordered, profuse, or difficult menstruation were associated with arthritis. In nearly half the patients, the arthritic attacks were paroxysmal, and were developed at each menstrual period, but subsided in the intervals. In many instances the joint affections disappeared when menstruation finally ceased, or when it was rendered normal by the treatment adopted. In three of these cases the affection was limited to, or mainly situated on, one side, and was associated with ovarian pain and tenderness on the same side, and also with the occurrence of neuralgia on the same side.

Such cases as these appear strongly to confirm the theory, discussed at some length in the chapter on Charcot's disease (chap. vii. page 80), that many examples of arthritis are dependent upon disorder of the higher nerve centres. A like view has lately been adopted by several writers in respect to the arthritis which occurs in men in connection with gonorrhœal, and more rarely with simple urethritis.

4. Another remarkable form of osteo-arthritis is that known as *morbus coxæ senilis*. This condition is much more common in men than in women, and after than before the age of forty. It frequently originates in a fall or other injury, but it is also often spontaneous. The first symptoms here, as in other varieties of osteo-arthritis, are stiffness and pain, often wandering through the limb, darting through the glutei or the muscles of the thigh, or taking the form of sciatica, lasting for many months, and obstinately resisting treatment. Wasting soon becomes very marked, the gluteal region is flattened, and the muscles of the thigh are shrunken and flabby. Motion is gradually lost, so that the pelvis rocks when the thigh is flexed, and rotation of the femur in the acetabulum also is lost. The thigh either remains extended

on the trunk, or slowly acquires some degree of flexion, showing itself as lordosis, but this is usually not very marked. The limb, however, undergoes shortening (the result of absorption of the head of the femur and upper border of the acetabulum) and rotation outwards, while it also becomes somewhat adducted. Under these circumstances the patient becomes much crippled, and finds it especially difficult to go up or down stairs, or to rise from a low seat. On examination, in addition to the symptoms already mentioned, it is found that the upper end of the femur is enlarged, and that the trochanter is lying distinctly, often considerably, above Nélaton's line, while, if movement is still present, grating or creaking is usually to be detected.

A striking deformity occasionally resulting from osteo-arthritis of the hip, is shown in Fig. 49, page 375, taken from a patient under the care of Mr. Lucas,\* in whom both hip joints in the course of osteo-arthritis had become fixed in a position of adduction combined with extension. A like deformity has been met with in cases of double hip disease. The method of walking adopted by patients with this distortion has been termed by the writer alluded to "cross-legged progression."

5. An example of osteo-arthritis to be carefully borne in mind is that which by no means rarely follows injury of the hip joint by a fall on the trochanter. This condition is usually spoken of as absorption of the neck of the femur. This name is inappropriate and misleading, for the changes that ensue are in every respect identical with those of osteo-arthritis arising in cases in which no injury has taken place. The acetabulum is enlarged, and surrounded by irregular formations of new bone: and the appearances observed in the femur are due, not, as they seem on a

\* Clin. Soc. Trans., vol. xiv.

casual inspection, to absorption of the neck, so that this part is primarily shortened, but to melting away of the prominence of the head, and to the presence of new bone deposited around its base and encroaching upon the neck. In these cases, in which the head appears to rest on the shaft without the intervention of a neck, the original head and the greater part of the neck have been completely lost, and the apparent head is in reality the base of the neck surrounded by a mushroom-like expansion of new bone. This form of osteo-arthritis, though met with chiefly in elderly people, especially in females, may occur in middle, or even in early, life. Thus Gulliver\* records examples of it in subjects, all being males, of the respective ages of fifteen, nineteen, thirty, thirty-two, and forty-five. The affection, though sometimes ensuing very slowly, often reaches a stage in which all its features are well marked in the course of a few weeks, so rapidly indeed as to give rise to the belief that the patient is suffering from overlooked fracture of the neck of the femur. I recently met with the following typical example. A lady, fifty-two years of age, fell heavily upon her left trochanter as she was joining in the fun and romp of a children's party. Although conscious of a severe bruise of the hip, she moved about during the remainder of the evening, and went up and down stairs without assistance. During the next three days she still went about, though with gradually increasing pain and lameness. She was then obliged to remain in bed. Pain about the hip was so severe that she could obtain no sleep, and the joint became stiff and the hip extremely tender. Six weeks later I found the limb an inch and a half shorter than its fellow, and everted; the trochanter was much less prominent than natural, and considerably above Nélaton's line, movement of the joint was

\* *Edin. Med. and Surg. Journal*, vol. xlv.



very limited, and attended with great suffering and with distinct grating. That this was a case of osteo-arthritis and not of fracture was, I consider, clearly proved by the fact that for two days after the accident the patient was able to go up and downstairs without help, and that the symptoms gradually increased in intensity, having at first been those simply of a severe bruise. These cases are important, not only in themselves on account of the circumstance that they may give rise to the belief that a fracture has been overlooked, but as illustrating the fact that one of the causes of osteo-arthritis is an injury which at the time may seem to be unimportant. In 1885, in the out-patient room at St. Bartholomew's Hospital, I saw a man, aged 48, whose right elbow joint was the seat of osteo-arthritis, which had ensued after a fall on the joint four months before he came under observation, and I have met with several examples of a similar kind in the shoulder, and with some also in the knee.

6. Usually chronic, osteo-arthritis occasionally presents itself in an acute form, as pointed out by several writers, particularly by Dr. Garrod and the late Dr. Fuller. The following account is taken from Dr. Garrod's article in Reynolds' "*System of Medicine*."\* I venture to copy it, as I am not aware of having seen this variety of the affection.

"Now and then cases of osteo-arthritis are met with which, in most of their symptoms, closely resemble acute rheumatism. Several joints are attacked, the swelling is considerable, there is distinct increase of temperature of the affected part, with pain, tenderness, and redness.

"In these instances, constitutional symptoms, as thirst, loss of appetite, heat of surface, a rapid pulse, and other evidences of febrile excitement, are often observed. There are, however, wanting the

\* Vol. i. p. 879.

characteristics of rheumatic fever, namely, the profuse sweatings and proneness to acute inflammation of the internal and external membranes of the heart, so common in acute rheumatism, and likewise the erratic disposition or tendency of the inflammation to fly from joint to joint. Between cases of genuine acute rheumatoid arthritis and those of the very chronic varieties, there is every intermediate shade of difference. As the acute disease is so little known and recognised by the profession, it may be well to give an illustration, and the following case may be taken as a typical example: A lady, forty-two years of age, when living in Australia, in the bush, was confined, and, being unable to procure a good supply of cow's milk, was induced to nurse her child for a period of twenty months (at the same time she herself had but a very deficient amount of meat); by these means she was reduced to an extremely weak state. After a short time she noticed that some of her joints became affected; at first the knees, then the ankles, afterwards the elbows and wrists, and lastly many of the small articulations of the hands. These parts were painful, somewhat swollen, hot, and tender, but the local symptoms were never intense, nor was the constitutional disturbance very great; that is, there was no high degree of febrile excitement. After a few weeks some of the joints were much injured, the knees, although reduced in size by absorption of the fluid, could neither be extended nor flexed, and the patient was soon unable to stand by reason of their rigid condition; the movement of several of the other joints was limited, although in a less degree. The causes of the debility being removed, the patient soon gained strength and flesh, and the tendency to the joint affection passed off, but not without having inflicted irremovable injury."

7. One of the most intractable varieties of osteo-



arthritis is that which is occasionally met with in young subjects. I have seen only a few cases at this period of life, and none under seven years. E. C. Seguin, however, states that he met with three cases, in the same family, in children between the ages of two and a half and four years. Moncorvo reports an instance in a child of two and a half; Laborde one in a child aged four; and Charcot one in a child of ten.\* The disease in some instances has been hereditary; in others it has followed scarlet fever, or been developed on the subsidence of acute rheumatism. In one case it affected only the knees. These became gradually flexed, enlarged, and fixed; creaking was felt when passive movement was used, and the articular margins of the bones were heaped up and everted or "lipped." In other examples the finger joints, the wrists, the elbows, the knees, and in one the ankles, became enlarged and stiff, and presented the general characters of the disease as it is seen in old persons. One of these patients, when I saw her last, was in her twentieth year. The disease had spread to all her large joints, so that she was unable to walk or to dress herself; in fact, she was already as helpless as patients of seventy often are who have suffered for years from the disease.

*Treatment.*—Although the morbid anatomy of osteo-arthritis is very much the same under whatever circumstances the disease occurs, I have thought it advisable from a clinical point of view to arrange the various examples to which reference has been made under distinct headings in order to emphasise the importance, when treatment is being discussed, of taking into account the origin of the disease in each individual case. This, in order that both the predisposing and the exciting causes of the attack may be as far as possible removed. If this method

\* Pepper: "System, Prac. Med.," vol. ii. p. 88.

is followed much better results will be secured than are obtained by the too prevalent custom of accepting it as a foregone conclusion that the disease is incurable, and treating it, in a half-hearted manner, as if all the cases alike were closely allied to intractable chronic rheumatism. In accordance with this remark, after certain general rules, universally applicable, have been stated, the further means that are called for in the different clinical groups will be referred to.

Though usually an essentially chronic affection, osteo-arthritis, as already pointed out, is sometimes acute. Reserving the latter variety for notice at page 74, I will now allude only to the chronic form.

The case of osteo-arthritis is an exception to the general rule that a diseased joint should be kept at complete rest. There can be no doubt that fixation of joints which are the seat of osteo-arthritis promotes stiffness. The patient should, therefore, be directed to use the joint in the ordinary way so as to give it moderate exercise. Fatigue, however, which would be followed by an accession of inflammation, should be carefully avoided. Movement of the limb, carried out while the patient is horizontal, so that no weight is thrown on the joint, is desirable. Passive motion is very useful, and, when circumstances permit, the patient should employ a well-trained rubber, who will daily, or three or four times a week for two or three months, perform passive movements, gradually increasing in their range, and will combine them with hot douching and friction of the joint and with shampooing of the neighbouring muscles. Many patients derive much benefit from this treatment, which greatly diminishes the pain, stiffness, and weakness of the joint, and checks atrophy of the limb. Even where a rubber cannot be employed, much can be done by an intelligent servant, or by a relative to whom the treatment has been explained. The joint should be protected from cold,

and from sudden changes of temperature, by being enclosed in a flannel knee cap or similar covering. The most efficient local application is undoubtedly heat combined with moisture, in the form of the hot bath and the hot douche. Patients unable to leave home should, using a large sponge or a piece of thick flannel, douche the affected joint with the hottest water that can be borne without discomfort, for ten minutes or longer, morning and evening, and much relief, both of pain and stiffness, may be obtained by enclosing the joint at night in warm lead and opium lotion, covered with oil-silk. Patients who have the means of doing so should go to some health resort where hot bathing and douching can be obtained: to Buxton, Harrogate, or Droitwich, in England; Aix-les-Bains, Wildbad, or Baden, on the Continent. At Buxton the water, which is strongly impregnated with nitrogen, rises from the springs at a temperature of about  $84^{\circ}$ . The baths are well arranged and convenient. The locality is 1,200 feet above the level of the sea, and though there is a heavy rainfall the weather throughout the summer months (from May to the end of September, or early in October) is, in dry seasons, delightful. Amusements are provided in the form of good music in a public hall, and large, well-kept public gardens. The neighbourhood affords numerous interesting excursions. Many sufferers go to Buxton for three or four weeks in May, though the weather at that time is apt to be cold, windy, and unsettled; and for a month or six weeks in August and September. In many cases the invigorating air exerts a very favourable influence on the general health. Harrogate contains a large and well-appointed bathing establishment, where the douche is very efficiently applied. The waters are alkaline and chalybeate, while some are largely impregnated with sulphur. The town, which, like Buxton, affords ample



accommodation for visitors, is situated at a considerable height above the level of the sea, and has a fine and bracing climate during the summer months. Though the rainfall is less than that of Buxton, the wind is often strong and cold in the spring and autumn. These localities should be visited mainly during the warm and dry months of the summer. While Buxton is best suited for cases in which the joint affections are unaccompanied by marked debility or anæmia, and in which the use of hot water alone is required, Harrogate affords the advantage of its alkaline and chalybeate waters to those who are weakly and anæmic, or whose arthritis is connected with the uric acid diathesis, or with the symptoms of ordinary rheumatism more or less acute. Droitwich is noted for its strong salt or brine baths, which often act beneficially in cases of osteo-arthritis. The climate of Bath (page 50), which is hot and relaxing in the middle of summer, is genial and soft in the spring and late autumn months. Strathpeffer, in Ross-shire, is much in favour, but its accommodation is limited. Among the best health resorts on the Continent for this affection are Aix-les-Bains, in the south of France (where all the arrangements of the baths are admirable; good accommodation can be obtained, if arranged beforehand, the climate is excellent, and the surrounding scenery is interesting and attractive), Wildbad, Baden-Baden, and Teflitz.

Besides the application of hot water, the local treatment of osteo-arthritis includes the use, when the joints are not tender, of liniments that should be gently rubbed into the surface. Useful formulæ for these are the following. Equal parts of *linimentum saponis*, *tinctura opii*, and *linimentum camphoræ compositum*; or *linimentum saponis* and *linimentum iodi* in equal proportions. Iodine, which certainly acts favourably in this affection, may be conveniently



applied in the form of the *tinctura iodi decolorata*. The general impression that counter-irritation is not of much service is probably mainly correct, but there are many cases, especially where any degree of inflammation is present, in which a series of small blisters, one being allowed to heal before the next is applied, may be advantageously used. In all cases alike the action of the skin should be encouraged by a daily tepid bath, with free soaping and subsequent rubbing of the surface of the body. In persons in fair health a Turkish bath once a week or fortnight is very beneficial. Diet should be moderate but nourishing, meat should be eaten sparingly, and should largely give place to fish, vegetables, ripe fruit, and farinaceous foods. Alcohol should be forbidden in all but small amounts. Malt liquors and acid and sweet wines should be discontinued. If wine be taken, it should be well matured. Sherry and champagne must be dry, and port should have been long in the wood. Probably whisky is the form of alcohol which is least likely to do harm.

In the first group of cases above mentioned, should gout or rheumatism be present, lithia (page 42), or if the urine is abnormally acid, alkalies, should be prescribed. An alkali may be given in the form of Vichy water, or twenty grains of citrate of potash may be taken in half a pint of water, either before breakfast or in the course of the morning. In some cases small doses of iodide of potassium do good, though this salt is apt to act prejudicially on the general health, and especially in persons above fifty. Sometimes small doses of arsenic continued for some weeks, especially when combined with iron or quinine, exert an obviously beneficial influence, but this drug often disagrees with the digestive organs in persons over fifty, and must be cautiously given. The treatment of *hydrops articuli* following osteo-arthritis is given at page 78, while that of synovial cysts is

discussed at page 178. The question of endeavouring to restore or improve motion by forcible movement, under an anæsthetic, is alluded to under *morbus coxæ senilis*. (See below.)

The main points in the treatment of cases of the second group (page 62) are, to prescribe iron, or quinine if anæmia is present, and to remember that both arsenic and iodide of potassium act more favourably than in elderly patients. In cases of prolonged lactation the child must at once be weaned. The treatment of the cases forming group three (page 62) must aim at the removal of the ovario-uterine disorders upon which the disease here seems to depend, a subject on which the surgeon will usually seek the assistance of a reliable specialist in this department.

It must be allowed that the treatment of *morbus coxæ senilis* (page 63) is often attended with very unsatisfactory results. When able to do so, the patient, as this affords the greatest probability of relief, should, as soon as the disease is detected, go to one of the health resorts alluded to above, and take a course of baths and hot douching extending over a full month. The joint should be kept in moderate exercise, and be warmly covered; blisters may relieve pain, and the wasting of the muscles may be checked by the use of the continuous electric current, which, however, to be of any service, must be applied, with regularity, for ten minutes, once or twice a day. The stiffness and crippled condition of the joint so often met with in advanced instances may sometimes be diminished by forcible movement under an anæsthetic. The cases, and they are very rare, that may be improved by this treatment are those in which the joint is locked by bony plates and osteophytes growing around the articular margins, and which admit of being snapped off or pushed aside by movement; or in which surrounding adhesions can be ruptured. As a rule,

forcible movement is decidedly prejudicial, for, without relieving either pain or stiffness, even for a time, it inflicts injury on the degenerate textures which tends to aggravate the malady.

In osteo-arthritis of the hip following injury (the cases in which the disease occurs in its more acute form) the joint should be maintained at complete rest, and intra-articular pressure should be prevented. These ends are best gained by keeping the patient in bed, and applying a weight of from seven to twelve pounds, while the limb is steadied between sand bags. This treatment is necessary, for the pain felt on movement, the spasmodic jumping of the limb, and the rapid wasting of the opposed articular surfaces, all show that the muscles around the joint are the seat of reflex irritation leading to intra-articular pressure, to which the persistence of pain is largely due. In this form of the disease, counter-irritation, produced either by blisters, or the actual cautery lightly applied, is also indicated. It must, however, be very cautiously resorted to in elderly or enfeebled subjects.

I know of no special remedies by which osteo-arthritis in the young (group 7) can be attacked. All that can be done is to prevent deformity by the use of light splints, to make full use of hot bathing and the hot douche, and to promote the general health by residence in a dry and warm climate, and by prescribing iron and cod-liver oil, with which small doses of arsenic may be combined. The treatment of acute osteo-arthritis must consist in maintaining the affected joints at rest, and in good position, and for this purpose splints may be required: in applying warm lead and opium lotion, or belladonna liniment, or enclosing the joints in cotton wool. Salicylate of soda should be given internally for the relief of pain, while should the patient be anæmic and weak, quinine and iron should be prescribed. As soon as the patient can



bear the journey, a visit to some health resort (such as Harrogate in the summer months or Bath in the colder part of the year), where bathing and the hot douche would be combined with a good climate, should be recommended.

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## CHAPTER VI.

### HYDRARTHROSIS (HYDROPS ARTICULI, HYDRARTHROS).

THE difficulty which is often met with of attaching a precise meaning to an old term introduced when nothing was known of pathology, and when leading symptoms were spoken of as if they were a disease in themselves, is encountered in the present instance. Hydrarthrosis, in its natural acceptation, merely signifies fluid in a joint, and makes no allusion either to its amount, or to the nature of the morbid action by which it has been produced; and it has followed as an inevitable result that so vague a phrase has been employed by different authorities to indicate diseases which have nothing in common with each other beyond the one particular feature of effusion into the joint. Some have applied the term to (*a*) any instance of chronic synovitis, with even slight effusion; some to (*b*) rheumatic disease, accompanied by excessive secretion; and some again (*c*) to those rare and obscure cases, in which a joint, apart from any distinct evidence of inflammatory action, becomes the seat of a large collection, sometimes amounting to two or three pints, or even more, of watery synovial fluid. It is therefore necessary, in order to avoid confusion, to state how the term will be employed in the present chapter. I shall limit it to the cases last mentioned, that is, to group (*c*). It seems better to keep the other forms of disease (*a*) and (*b*) apart, and to refer to them in the chapters



in which the affections of which they form a part are discussed. The cause of hydrarthrosis has not at present been conclusively ascertained. Probably, however, it is the result of ill-marked osteo-arthritis. It makes its appearance in the form of a slow and continuous secretion of a watery or serous form of synovia, which gradually distends the joint capsule. At no time is there any appreciable increase of vascularity of the synovial membrane, and the affection is nearly painless. The membrane assumes a dull, yellowish-white colour, and presents a sodden, macerated appearance. After the lapse of a considerable period, the subserous layer is the seat of a slow formation of fibrous tissue, so that the synovial membrane becomes greatly increased in thickness, especially where the natural folds exist. At the same time the synovial fringes become hypertrophied, and new processes are formed, so that the surface, which is ordinarily smooth, becomes rough and shaggy, and covered with thickly-set pedunculated, dendritic, or villous growths, with here and there large soft processes of cedematous synovial membrane. In these hypertrophied processes nodules of cartilage may be developed. These are usually small, but some may attain the size of a nut, or even of a walnut, and be easily felt by external examination. In some instances either one of the fringes just described, or one of the nodules of cartilage may become detached, so as to form a loose body in the joint. In a joint that has long been the seat of hydrarthrosis the amount to which subserous thickening and intra-articular tufted growth take place may be so great that, although enlargement is considerable, scarcely any fluid is present. As time goes on the nutrition of the ligaments is interfered with by the process of soaking to which they are exposed, and they become soft and weakened, so as to allow partial displacement of the articular surfaces. The cartilages also gradually become fibrillated,

and are slowly worn away. Another feature of these cases is that any bursal cavities in communication with the affected joint are liable to undergo hyperdistension, and their enlargement may in some instances mask the real nature of the disease. A joint affected with hydrarthrosis shows little tendency towards recovery. Indeed it will be readily understood that when once the synovial membrane has become changed in the manner just described, it is almost impossible for it to regain its natural state. The disease, on the contrary, usually continues to advance, so that the articulation becomes greatly enlarged, loose, and so weak that no weight can be thrown upon it. Frequently the corresponding joint on the other side becomes similarly diseased. This is especially the case with the knees, the joints that are much more than any other liable to be attacked. As already mentioned, although the symptoms of inflammatory action are absent in this affection, it is probably a very slowly advancing form of osteo-arthritis. The anatomical changes strongly resemble those met with in the latter affection, while, although fluid in the later stages of the ordinary form of osteo-arthritis is absent in many cases, in the early stage it is present in considerable amount. The view that the affection consists merely of a passive dropsical effusion has been adopted by many authorities, and must be mentioned here. It is not, however, supported by any pathological fact.

The affection is most common in the knee, though it may be found in the shoulder, elbow, and ankle. In the knee, the instance that will here be described, it is characterised by the development of considerable enlargement of the joint, usually depending in great part on effusion into its cavity, but due to some extent also to thickening of the synovial membrane. In some cases as much as two or three pints of fluid are present. The joint is distended

in all directions, laterally, and upwards beneath the quadriceps extensor, bulging of the synovial membrane being especially marked where the capsule is thin. The patella rides on the summit of the swelling, and can be pressed down so that it strikes the condyles, unless, indeed, the distension is too great and too firm to permit this. Fluctuation is very distinct in all the axes of the joint. Sometimes on deep pressure the thickened condition of the synovial membrane can be felt, and enlarged and indurated folds and fringes can be made out. In some instances the fluid passes into, and distends the bursa under the semimembranosus muscle, or the whole of the popliteal space, and even makes its way for some distance beneath the muscles of the leg, so as to produce a fluctuating swelling in the ham and upper third of the calf.

In some cases, indeed, the joint is almost entirely powerless, so that the patient walks with great difficulty. The affection is met with at all ages after puberty, but is most common in persons between thirty and sixty, and is more frequent in men than in women.

*Treatment.*—When the affection is recent the joint should be kept at rest by means of leather splints, which leave part of the surface exposed, and a succession of blisters should be applied. These should be from two to three inches square, and should follow each other at intervals of three or four days, so that one is healed before the next is put on; or sharp irritation of the skin may be effected by rubbing in every morning, or at appropriate intervals, the *unguentum hydrargyri biniodidi*; or the tincture of iodine may be painted on often enough to ensure the same result. After the joint has been thus freely blistered for three or four weeks a Martin's elastic bandage may, when the skin will bear it, be applied. In cases in which blistering and pressure have failed, the joint may be aspirated, and the treatment by the elastic



bandage may be again tried for a period of six weeks or two months. These means not succeeding, several surgeons have, after withdrawing part of the collection, injected an equivalent amount of a solution of tincture of iodine in two or three parts of water. Formidable as such an operation sounds, it appears to be attended with slight danger if care is used in its performance. It must be confessed, however, that its success, in the advanced form of the disease, is doubtful. It is followed by considerable inflammatory effusion, such as is seen after the injection of a hydrocele; but in many instances, when this has subsided, the fluid, in very much its original character, soon returns. The callous condition to which the synovial membrane of these joints may be reduced was illustrated by the case of a man, whom I lately saw, in whose knee joint an opening, the result of an aspiration puncture, had remained unclosed for several months, and through which watery synovial fluid constantly drained away.

In a case of hydrarthrosis of the knee, which had resisted all milder forms of treatment, Mr. Willett opened and drained the joint in the following manner: \*

"Under antiseptic precautions an incision two and a half inches long was made from the centre of the outer border of the patella directly upwards into the joint. A considerable quantity of turbid serum, mixed with flakes of lymph, escaped. A second incision was made for the same distance downwards, along the inner border of the patella; and a third, of the same length, at the outer and back part of the knee, from the head of the fibula to the inner border of the tendon of the biceps in a direction upwards. The joint was washed out with carbolic lotion, the synovial membrane well scraped, and afterwards swabbed out with a solution of chloride of zinc, ten grains to the ounce." A drainage tube was passed between the first

\* St. Bartholomew Hospital Reports, vol. xix. p. 206.



and second openings, and a bundle of horsehair, previously soaked in carbolic lotion, between the second and third. The limb was put up on a straight back splint and a long outside Liston's splint. Pain greatly diminished after the operation, there being only occasional startings of the limb. The temperature rose on one occasion to  $102.2^{\circ}$ , but after the sixth day was natural. Five weeks afterwards all the drainage tubes were removed, and in another week the wounds were nearly closed, and the patient could lift his leg without pain. A month later the limb was put up in plaster of Paris, and the patient got up. Seven weeks later the plaster was removed. There was then no fluid in the joint, but the synovial membrane was somewhat thickened. The patient could flex the limb to an angle of  $30^{\circ}$ , and walk with the aid of crutches. He was examined several months afterwards, and was found to have retained a very useful joint, free from swelling, and possessed of considerable movement.

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## CHAPTER VII.

### CHARCOT'S DISEASE.

IN 1868 Professor Charcot gave a lecture on the relation between certain forms of joint disease and tabes dorsalis (locomotor ataxia). The subject, at first overlooked in England, was brought forward some years later by Dr. Thomas Buzzard, so well known for his researches in the pathology of the nervous system. These joint affections, under the title of Charcot's disease, have recently attracted much attention, and were made the topic of a prolonged discussion, founded on a paper by Mr. Baker, at the Clinical Society of London in the session 1884-85. In the course of the debate it became apparent that wide differences of

opinion were entertained by different speakers, not only as to the nature of this assumed connection between the joint disease and ataxia, but also as to the question whether the joint affection has any existence apart from osteo-arthritis, which, in many of its features, it undoubtedly very closely resembles. Thus the subject is involved in much obscurity, and there are many important points which must be left for the present entirely undecided. These, however, refer chiefly to pathology. There is less difficulty in giving an account of the disease from a clinical point of view. I shall enter upon this first, and it may conduce to clearness if I refer, at the outset, very briefly to the symptoms of locomotor ataxia. These are: loss of co-ordination, leading to an unsteady gait, especially in the dark, or when the eyes are shut, and, later, to various irregular jerking movements of the limbs; inability to stand when the feet are placed together, and the eyes are closed; difficulty in running and going up or down stairs; loss of sexual power; incontinence of urine and obstinate constipation, with occasional unconscious passage of *fæces*; loss of tendon reflex, or in other cases its marked exaggeration; impaired vision; optic neuritis, detected with the ophthalmoscope; a defective condition of the eye in which, while the pupil acts in accommodation, dilating when distant objects are looked at, and contracting when objects are near, it does not respond to the stimulus of light; (this is Dr. Argyll Robertson's test); gastric crises, consisting of violent griping, or cramp-like pains in the abdomen; sudden flashings or lancinating pains, the so-called lightning pains; constant severe neuralgic pains, attended with cramp-like muscular contractions; local sweating, and various wandering pains and disordered sensations in the limbs.\*

\* For a further account of ataxia, see Buzzard, "Diseases of Nervous System," 1882.

All the above symptoms occur in ataxia; but in different cases they meet each other in a great variety of combination, so that scarcely in any two instances are precisely the same features to be observed. So far, indeed, is this the case that so high an authority as Dr. Wilks \* holds that no such disease as locomotor ataxia exists, and maintains that under this common title various diseases of the central nervous system have been confusedly thrown together. This is a view upon the correctness of which further investigation must decide; and it must here suffice to state, that when a patient presents the symptoms enumerated above, or any clearly marked combination of them, the disease of the nervous system from which he suffers passes, with the generality of physicians, under the name of *tabes dorsalis*, or ataxia.

A remarkable complication of ataxia is that of perforating ulcer, a disease which is met with chiefly in the sole of the foot, and which, commencing on the surface, often under the ball of the great toe, spreads inwards to the deeper structures until in many cases the metatarso-phalangeal and other joints of the toes, or of the tarsus, are reached and destroyed.† This malady will be again referred to.

A general view of Charcot's disease will be obtained from the following cases, which have been under the care of different members of the staff of St. Bartholomew's Hospital, or which are abridged from Mr. Baker's paper: ‡

*Case 1.*—A woman, aged fifty-four, seen in 1883, had disease of the right elbow and both hip joints, with symptoms of advanced locomotor ataxia. The notes state that her illness began about twenty years ago,

\* *British Medical Journal*, vol. ii. p. 84.

† See a valuable paper by Mr. Savory and Mr. Butlin, *Med. Chir. Trans.*, vol. lxi. p. 373.

‡ *Clinical Society's Trans.*, vol. xviii. p. 44.



when she had lightning pains in the legs. These had persisted, and are now more constant and more severe. Soon after boring pains, as if a hot skewer were thrust into the flesh, set in. At first these were confined to the vicinity of the hip and knee joints, but now extend all over the legs and arms, and occasionally on the body, and are very severe. About the same time she had a sensation of constriction around the waist, legs, and thighs, at first occasional, but now almost constant. Many years ago she had diplopia, and of late her vision has been very defective, and not benefited by glasses. She has *musca*, and objects appear very misty. Ataxic symptoms began eighteen years ago. Her feet felt as if "wrapped in something soft." The movements were tremulous, and rapidly became worse, so that she could only with difficulty walk so short a distance as across the road, and she was obliged to watch her feet. She could not walk or stand in the dark. At present she cannot lie down unless a light is burning in the room. Seventeen years ago she was under Dr. Wilks and Dr. Habershon in Guy's Hospital, and was said to be suffering from paraplegia, having lost motion and sensation in both legs. She has partially recovered from this, but for eight years could not use her legs in the least. Before she was admitted, and while in Guy's Hospital, she had severe obstinate vomiting, but no violent abdominal pains.

*Present condition.*—Patient is anæmic and very debilitated; pupils are dilated, and do not respond to light, but contract on looking at near objects. She has occasional violent headaches and neuralgic pains shooting through the lower jaw and temporal region. She has constant pain in the epigastrium, occasionally extremely acute, and at times attended with vomiting, the "crisis lasting several days." She has also boring, lancinating, and constrictive pains in the abdomen. She has scarcely any power in the lower



extremities. Tactile sensation is much impaired. There is no patellar reflex and no ankle clonus. There is sometimes involuntary micturition, sometimes difficulty in micturition, and in defæcation ; occasionally she has forcing pains in the bladder and rectum. The bowels seldom act without medicine.

*Joints.*—The right elbow is four and a half inches larger in circumference than the left, and has a roughly globular outline. It is tense, and in parts elastic, apparently rather from thickening of the synovial membrane than from the presence of fluid. There is grating on movement, and the joint is loose and admits of abnormal motion, both in a lateral and an antero-posterior direction. Hard nodules form part of the enlargement, especially on the inner aspect. The joint feels as if scarcely held together at all by ligaments ; but the patient is able to bend and extend it almost perfectly, although with creaking and grating. Sometimes there is a momentary lock, but then suddenly the joint surfaces slip again. Sensation is defective in the little, and ulnar side of the ring finger. The elbow became affected a year ago, after a slight injury. The hips present the same loose, flail-like condition that exists in the right elbow. The trochanters lie an inch above the anterior iliac spines ; but they can be drawn down to their normal level, retracting, however, when extension is removed. The joints grate on movement. The head and neck of both thigh bones seem to have entirely disappeared. No nodular deposits of bone can be felt. The hip joints have been affected for many years. The great toe of the right foot is shorter by an inch than the left. The metatarso-phalangeal joint moves freely, with distinct grating. Three scars are visible on the toe, left after the healing of three perforating ulcers, which closed three years ago under the use of stimulating ointment.

*Case 2.*—A man, aged 56, admitted 1884, under

Mr. Baker. Two years previously, having all his life enjoyed excellent health and having never had syphilis, he gave his right knee a severe twist. The joint at once began to swell, and he walked with great difficulty. Three weeks later, though he had kept his bed, the knee was still swollen; but he could bend it and walk without much pain. Three months after the accident he went to a bone setter, who moved the joint about once a fortnight. He was next at the London Hospital, where the joint was placed on a splint, and enclosed in an indiarubber bandage.

*Present condition.* — The right knee is much swollen and distorted, and three inches and a half larger than the left. The internal condyle of the femur, though preserving its normal shape, gives the idea of being enlarged and of projecting downwards and inwards, and not resting at all on the inner half of the head of the tibia, which has apparently been absorbed. The external condyle has almost disappeared, and in its place can be felt a semidetached rounded nodule of bone, freely movable, and about the size of a walnut. The outer half of the head of the tibia seems to take the place of the wasted external condyle of the femur, and projects about four inches higher than the internal condyle of the femur. The joint is very loose and flail-like, allowing hyper-extension of the tibia on the femur, and the leg can be easily bent outwards and inwards. Grating accompanies movement. The patient suffers no pain in the joint. Beneath the right great toe is a small perforating ulcer an inch in depth. In both legs sensation is impaired. There is no tendon reflex or ankle clonus. The patient has had "lightning pains" in all parts of his body. Pupils are contracted and do not act to light; they contract when near objects are looked at. During Mr. Baker's absence from London the great toe was amputated, and though the patient did well at first, he ultimately died of septicæmia.

On examining the knee the synovial membrane was found much thickened. The external condyle of the femur (Figs. 9 and 10) had almost disappeared, and was replaced by two nodules of bone, together as large as a chestnut, which were embedded in the thickened synovial



Fig. 9.—Mr. Baker's Case of Charcot's Disease of the Knee Joint.

membrane. The internal condyle was flattened laterally, and deeply grooved from contact with the head of the tibia. The condyle, in fact, resembled an enormous internal malleolus. At the back of the internal condyle was a large bony mass, lodged in a cup-like cavity in the head of the tibia. The inner part of the head of the tibia was completely worn away by the internal condyle of the femur, while the outer side

took the place of the lost external condyle of the femur (Fig. 9). To such an extent had this change occurred that the line of the tibio-femoral articulation, instead of being nearly horizontal was almost vertical, while the only part of the bones which could serve as a support in walking was the narrow ridge on the femur, which rested on a corresponding narrow



Fig. 10.—Mr. Baker's Case of Charcot's Disease of the Knee Joint.

surface of the tibia. The bone exposed by the eroding process was, for the most part, smooth and hard, but in places the cancellous tissue was exposed, as in caries (Fig. 10). The cartilage had almost entirely disappeared but here and there patches were still seen. These had undergone fibrous degeneration. The patella was thickened and irregular, and its cartilage was in a state of fibrous degeneration. The synovial membrane presented numerous villous growths, some calcareous, while others were still soft. The development



of osteophytes had taken place to a remarkable extent. Nodules were, so to speak, infiltrated in the tissue around the ligamentum patellæ, and in various parts of the synovial membrane. The edge of the head of the tibia was covered by irregular overhanging ridges of bone exactly resembling those found in osteoarthritis. At a distance of about four inches from the joint both the femur and tibia appeared perfectly normal. The frontispiece of the present volume depicts a case, recorded by Mr. Baker, in which "the whole of the posterior surface of the upper end of the tibia, for a distance of three inches, is worn away in such a manner as to allow of the dislocation of the bone forward upon the femur."

*Case 3.*—F. N., æt. 49, a farm bailiff, was admitted to St. Bartholomew's Hospital in March, 1885, on account of a swelling in one of his knee joints. He said that his general health had always been good. He gave an account of a venereal sore fifteen years previously, the nature of which was doubtful. His family history was good. For the past eight or ten years he had suffered from sharp shooting pains in his legs, which at times were very severe. Four years previous to admission a perforating ulcer had formed beneath the metacarpo-phalangeal joint of the great toe; some dead bone came away, and the sore healed in six months. About the same time he noticed that his eyesight began to fail, that he could not run, and that his gait was unsteady, especially in the dark. Eighteen months previous to admission the right foot and ankle swelled. In August, 1884, he fell off a reaping machine and hurt his right knee. He did not lie up, but continued to do his work for a month; at the end of which time the knee was greatly swollen and somewhat painful, and he was obliged to rest for four weeks. After this he was in the Kidderminster Infirmary for two months. One knee has steadily got weaker until

the present time. He has latterly had a sensation as of a tight belt round his waist.

*Present condition.*—Whole right extremity larger than left; knee joint much swollen, and shapeless; it creaks and grates when the patient flexes and extends the leg. The head of the tibia is much altered by large bony outgrowths around it. There is free lateral movement, and the whole articulation feels very loose. No pain on flexion or extension. Right tarsus swollen and puffy. Scars beneath metatarso-phalangeal joint of toe. No patellar reflex in either leg. No ankle clonus. Impaired cutaneous sensibility in right foot. Has double optic neuritis, but pupils react to light.

*Case 4.*—Henry G——, aged forty-two, engine fitter, was admitted under my care in 1885. Twenty years ago he had syphilis. Has always been a hard drinker. Eighteen years ago had a kick on the left knee, from which he entirely recovered.

Five years ago he had three fits, apparently of an epileptiform character. At the same time he suffered from shooting pains in the limbs, and his left knee joint began to get stiff and painful. He soon commenced to have slight difficulty in walking, especially in the dark, and was a patient at St. Bartholomew's Hospital for some time, suffering from perforating ulcer of each great toe. With these symptoms he also had failure of vision, especially in the right eye. Three years ago he was troubled with frequent nocturnal emissions; these have latterly subsided. Has now but little sexual power.

The left knee joint has been getting worse for the last five years. He has twice been treated at other hospitals for osteo-arthritis.

*Present condition.*—Looks older than his years.

*Eyes.*—Pupils react to accommodation, not to light. Grey atrophy of right disc. Field of vision much contracted in right eye. Colour blindness for red

and green in the same eye, and perception for yellow and blue impaired. Left eye commencing atrophy of disc.

Has difficulty in standing or walking with the eyes shut, and staggers in his gait. The great-toe joints are ankylosed. The left foot sweats excessively. Slight inco-ordination in right upper extremity, as evidenced by difficulty in touching his nose when his eyes are shut.

*Arms.*—Numbness in each little finger.

*Thorax* }  
*Abdomen* } are natural.

*Legs.*—No tendon reflex; cremasteric reflex good. Left knee much enlarged, with great bony outgrowth from inner condyle of femur. Tibia much lipped. Patella enormously increased in size. Much fluid in joint. Shortening of limb half an inch. Movements of joint abnormally free in every direction, and accompanied by much grating and creaking. The joint surfaces are oblique instead of horizontal, the tibia being worn away behind and the femur in front.

When we analyse these cases we see that they are formed of two elements: disease of the central nervous system, and an affection of the joints. The evidence of disease of the nerve centres varies considerably in different instances, and consists of different combinations of the symptoms enumerated at page 81. Many of these symptoms are frequently absent, and it therefore becomes necessary in any doubtful instance to go carefully through the whole list, and to form a conclusion only when all the phenomena that occur in locomotor ataxia have been passed in review. There can be no doubt that the early signs of disease of the spinal cord and brain are often overlooked in these cases. The affection of the joints, both in its symptoms and its morbid anatomy, bears, as already said, so close a resemblance to osteoarthritis that many observers maintain that they are



one and the same disease. This is Charcot's disease, as in osteo-arthritis, the joints attacked become enlarged, sometimes by accident thickening of the synovial membrane, sometimes by collections of them to twenty ounces, or much more, of granular fluid, mixed with turbid fatty serum. Sometimes large periarticular collections, or cysts, are developed. The articular bodies become fixed and the joints may be rendered deformed or ankylosed by the growth of adventitious masses of bone about the articular ends. Grating or creaking is often felt on movement. Probably the knee is most commonly affected, but all are liable to be involved, even the small joints of the hand and foot.

These changes may be attended with considerable pain, and the patient may be unable to use the limb. It is, in fact, only in the later stages of the disease, or in exceptional instances (see below), that any striking divergence from the symptoms and general course of osteo-arthritis is observed. This, however, arises when the joint becomes disorganised by the wide destruction of the ligaments and the articular ends of the bones, producing great deformity and allowing wide displacement of the bones on each other; and when, moreover, it is observed that, though such very extensive changes have occurred, the patient still uses the limb, and has but slight pain, or perhaps no pain at all in the joint. The exceptional instances referred to above are those in which the joint affection, beginning suddenly by a large effusion into the synovial cavity, and oedema of the limb, makes such rapid progress that, in the course of five or six weeks, the destruction of the articulation and of the adjacent ends of the bone is complete. Thus the clinical features observed in Charcot's disease, though they bear originally a close resemblance to those of osteo-arthritis, frequently transcend, both in their ultimate extent and in the rapidity with which



they sometimes make their appearance, anything that we are familiar with in the latter affection.

*Morbid anatomy.*—When the joints are dissected, the appearances disclosed fully explain the clinical aspect of these cases. The synovial membrane is, in the early stage, just as in osteo-arthritis, thickened, and its fringes are subdivided and enlarged. The cartilages, at first the seat of fibrous degeneration, are at length entirely destroyed, so that no trace, or only a small patch here and there, remains. The ligaments become softened and loosened from their attachments, and then completely disappear. The ends of the bones, as the cartilage is lost, are exposed, and worn down where they are subject to pressure, while around their borders and elsewhere, where no pressure takes effect, nodular irregular osteophytic masses are developed. By these changes the remarkable condition shown in Figs. 9 and 10 is produced. However the process at work is brought about, it evidently here, as in osteo-arthritis, consists of two factors: (*a*) excessive waste, amounting in parts exposed to the mechanical agencies of pressure and friction to complete wrecking of all the structures concerned, and to such an amount of interstitial disintegration, or degeneration of texture, that spontaneous fracture is by no means rare (Buzzard and Charcot); (*b*) hypertrophy and reproduction, leading by the heaping up of new tissue to "lipping," and to the accumulation of irregular masses of ill-formed bone, about the confines of the joint. These two elements are observed in osteo-arthritis (pages 54 *et seq.*), and of the two the degenerative change is usually the most apparent. In Charcot's disease the magnitude which these changes present, and the high degree which degeneration and waste attain, are especially to be observed.

As to the pathology of Charcot's disease and the relation which it bears on the one hand to ataxia, and

on the other to osteo-arthritis, little that is definite can at present be said. All must look forward with great interest to the forthcoming report of the Clinical Society's Committee, of which Sir James Paget and other well-known authorities are members.

In the meantime an insuperable difficulty, which presents itself in maintaining either the identity of, or the essential difference between, Charcot's disease and osteo-arthritis is that we know nothing, and have agreed to nothing, as to the real nature of the latter affection. Is it dependent on an abnormal constitution of the blood, or is it, as some believe, the result of changes in the central nervous system? How is it related to gout or to rheumatism, or is it the outcome of an admixture of these two conditions? Is it one disease, or several forms of disease not yet disentangled from each other? These are questions about which, although different writers have committed themselves to strong views, there is as yet no consensus of opinion. Nor must we lay too much stress on the mere objective resemblances between Charcot's disease and osteo-arthritis, for numerous instances might be adduced in which the same symptoms and the same morbid appearances are produced by very different forms of morbid action. I will here venture upon nothing further than the opinion that, although in many instances the clinical features and morbid anatomy of Charcot's disease are identical with those of osteo-arthritis, yet when all the cases that present themselves (the extreme as well as the early and medium examples) are taken into account, Charcot's disease, though travelling on much the same lines, and attended with the same phenomena of disturbed nutrition (as indicated by reproduction, combined with excessive waste amounting in many instances to widespread destruction of all the constituent structures of the joint) goes, in the amount of destructive change, so far beyond anything that is

seen in osteo-arthritis, as this affection has generally been described, that probably there is some wide pathological difference between the two conditions. The nature, again, of the relation of the joint disease to the affection of the nervous system is at present obscure.

The view that the connection is merely a coincidence, that, as both ataxia and osteo-arthritis are common disorders they must, unless the one excludes the other, be occasionally found in the same individual, is disproved by the fact which, I think, has been clearly made out, that examples of joint disease are met with in ataxia which are never seen in any other connection. On the other hand, there appears ground for holding that osteo-arthritis and Charcot's disease may be so far related to each other that they both belong to a group, recently brought to light, in which profound changes in nutrition appear to be directly dependent on lesions of the nervous system. I allude to the atrophied and shiny condition of the skin (the glossy fingers of Sir James Paget) and the ankylosis, often bony, of the finger joints, which Mr. Bowlby informs me frequently occurs after injury of the nerves of the fore-arm; the ulceration and tedious skin diseases observed in the limbs of hemiplegic subjects; and, most important of all, for it strongly resembles the destructive joint lesion under discussion, the "perforating ulcer" which is so commonly found about the foot, in cases of ataxia.

The agency by which disease of the nervous system induces these joint affections is quite unknown. Even the physiological basis for an opinion on the subject is wanting. For whether there exist distinct centres in the cord for the nutrition of different parts, as some hold, and whether there are special trophic nerves, these and other main points still await decision.

The question as to the part which syphilis takes in the development of Charcot's disease demands notice



alike from a pathological and a clinical point of view. The opinion expressed by Sir James Paget\* is that the joint affection is the outcome of an admixture of several morbid conditions, notably of gout, rheumatism, and syphilis. No doubt ataxia is frequently preceded by constitutional syphilis, and in many cases it is probably directly due to syphilitic disease of the nervous system, a fact not to be overlooked when treatment is being determined upon. On the other hand, however, there are many instances of ataxia and of Charcot's disease in which no history of syphilis can be obtained; while the doctrine that Charcot's disease is the result of evolution, and has been gradually developed by inheritance through ancestors in whom the admixture of syphilis with other morbid elements has taken place, must, I think, remain as the subject of further study. For the arguments for and against the view that Charcot's is a new disease, the reader should consult Sir James Paget's Bradshawe lecture, in which the highly interesting doctrine of the evolution of disease is fully discussed; the same author's "Clinical Lectures and Essays," † and the debate at the Clinical Society.

In the great majority of instances in which the peculiar changes met with in a well-marked case of Charcot's disease are developed, the patient is found to present distinct evidence, when critically examined, of disease of the nervous system (page 81). In other words, the symptoms of ataxia very generally precede or accompany the joint affection. Cases are, however, sometimes met with in which the joint disease is present for some time, and makes considerable progress, before any symptom of nerve disorder can be detected. I have lately seen a patient (under the care Mr. Thomas Smith) who was suffering from an affection of the hip joint, which was indistinguishable from Charcot's disease; but who had no symptom whatever of ataxia.

\* Clin. Soc. Trans., vol. xviii. p. 69.    † Second edition.



It is obviously open to those who believe that Charcot's disease is merely osteo-arthritis, to quote this and similar examples (in which all the changes ascribed to Charcot's disease are present, without the slightest evidence of disease of the nervous system), as tending to confirm their view. My own opinion is that this patient will sooner or later become ataxic. This point, however, must remain in doubt. I relate the case in order that all available evidence, whatever its bearing on the subject, may be recorded. It is certainly necessary, without falling into the absurdity of finding Charcot's disease in every case of osteo-arthritis, to be on the watch in obscure examples of disease attacking a single joint, especially if the articulation is free from pain, although the seat of advancing deformity, for the occurrence of ataxic symptoms.

*Treatment.* — Under this head there is, unfortunately, very little to say. Not cure, but some palliation only can be attempted. In the early stage of the disease the same general rules of treatment must be followed as have been laid down for the management of osteo-arthritis (page 68 *et seq.*). Moderate exercise may be allowed, and warm douching and friction will be of some service. In the later stage when rapid disorganisation of the joint is going on, the progress of the disease may be materially checked by complete rest and the use of splints. Indeed, considerable improvement may sometimes be thus secured. Should there be evidence, or even a suspicion, of constitutional syphilis, mercury or iodide of potassium should be given. If gout or rheumatism is present it must be treated. A caution may be given against the performance of amputation. If ventured upon this operation is very likely to be attended by a fatal result. Excision is equally to be avoided, for no sound repair could be anticipated. For a notice of the disease in the different joints, see shoulder, elbow, etc.

## CHAPTER VIII.

## SCROFULOUS DISEASES OF THE JOINTS.

FROM a clinical point of view, scrofula (or struma) consists of a defective state of the general health, with which is associated a tendency to certain forms of chronic inflammation, leading to suppuration and caseation, and chiefly involving the lymphatic glands, cancellous bone, mucous and synovial membranes, and the skin.

The pathology of the disease is still under discussion. In the opinion of many observers, these affections are produced as the result of a tuberculous inheritance, want of good food and fresh air, and other conditions which impair the general health, and under the influence of which normal nutrition deviates into low forms of inflammatory action. By others, including some of the ablest pathologists of the day, recent investigations are regarded as having placed the whole question of the nature of tuberculosis, and the relation of scrofula to this affection, in a new light. The discovery of the tubercle bacillus by Professor Koch, and the elaborate experiments which he and others have performed, are held to have conclusively shown (*a*) that tuberculosis is a chronic and infectious parasitic disease, which is produced by a tangible organic contagium, and that tubercle is an inflammatory product resulting from the irritative action of the bacillus in the tissues in which it is engrafted; (*b*) that scrofula, though presenting certain modifications arising from the difference of the tissues in which it is seated, and other circumstances, is, from a pathological point of view, identical with

tuberculosis. This view is stated with great clearness in an able article by Mr. Eve in Treves' "Manual of Surgery." \* The latter contention rests on the fact that all the structures regarded as characteristic of tuberculosis, including Koch's bacillus, are present in scrofulous inflammations, and that when animals are inoculated with the bacillus obtained from scrofulous inflammation and isolated by a series of pure cultivations, tuberculosis is the result.

The difficulty, however, in accepting the proposition that scrofula, using this term in its usual clinical sense, is the result solely of the irritative action of the tubercle bacillus, is that in many cases of scrofulous disease of the synovial membrane of the joints, of cancellous bone, and of the skin, the bacillus, according to many trustworthy observers, cannot be found. It will thus be seen that the pathology of scrofula is a subject that is still in dispute. It is, however, one into a full discussion of which the space now at my disposal will not allow me to enter. I must refer the reader to the article, by Mr. Eve, already mentioned, and to recent authors on surgical pathology.

An excellent illustration of the naked eye appearances of tubercle deposited in the articular ends of the femur and tibia is given in Fig. 11.

Scrofulous inflammation may commence either in the synovial membrane or in the articular ends of the bones: but the relative frequency of the two forms probably varies in the different joints. When disease begins in the synovial membrane, this structure becomes swollen and opalescent, and is found on section to be succulent and loaded with exudation products, while its surface loses its smooth appearance, and is gradually changed till it assumes the aspect of granulation tissue. As the disease advances the membrane becomes thickened, soft, and friable (Brodie's pulpy

degeneration), and here and there, both in the membrane itself and in the subsynovial tissue, masses of caseous material are found. In the later stages suppuration often occurs. When once established in the synovial membrane, the inflammatory process soon



Fig. 11.—Tubercle deposited in the articular ends of the Femur and Tibia. (From a preparation in the Museum of St. Bartholomew's Hospital.)

extends, so that the articular cartilage, the ligaments, and frequently the ends of the bones also, are involved. The cartilage loses its natural bluish-white tint and polished surface, and becomes yellowish-white, dull, and opaque. Wherever its margins are overlapped by



the vascular synovial process, it undergoes erosion (Fig. 12) or even complete destruction ; or the synovial

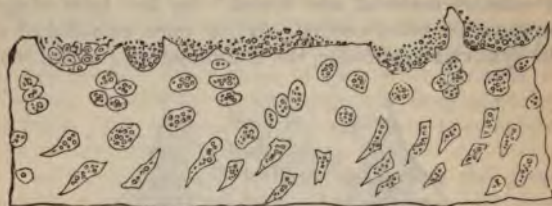


Fig. 12.—Ulceration of Articular Cartilage in Strumous Joint Disease, showing fatty degeneration of the surface cells. (After Billroth.)

membrane acquires firm adhesions to its surface, vessels enter its substance, and a number of pits and excavations are formed containing granulation tissue



Fig. 13.—Destruction of Cartilage in Strumous Disease, extending from the Synovial Membrane. The surface of the cartilage is covered by granulation tissue. (After Billroth.)

(Fig. 13). These, continuing to increase, coalesce into large hollows and spaces, and by degrees the bones are entirely denuded. The ligaments become permeated with newly formed blood-vessels, and undergo swelling,

softening, and partial or complete destruction. The ends of the bones in like manner, as the inflammatory process reaches them, are rendered vascular and enlarged (though this appearance is often deceptive), and become either carious or necrosed. Thus, if the mischief is allowed to advance, a general arthritis, involving, and leading to the disorganisation of, all the constituent parts of the joint, is established. In other instances the inflammatory action originates in the ends of the bones, and the articular lamella is replaced by granulation tissue. The vessels of this tissue produce erosion of the deep layer of the articular cartilage, which thus becomes detached from the bone, so that it can be easily separated as a thin scale. (See Fig. 14.)



Fig. 14.—Necrosis of Cartilage in Strumous Disease. (From the Museum of St. Bartholomew's Hospital.)

Mischief spreads to the synovial membrane and the ligaments, and, as before, general arthritis becomes established.

In their clinical aspect, scrofulous diseases of the joints constitute a very important group. They are of frequent occurrence; they involve all the principal articulations; they are, with few exceptions, the only affections of the joints, setting aside tumours and the results of injury, which call for such proceedings as amputation and excision; they are attended, in many instances, with severe and prolonged suffering; they often leave the patient crippled for life; they are fatal, or, at least in the past, they frequently have been so. But there is a further ground on which these diseases claim our careful attention. The estimate that

is often formed of them is derived partly from tradition, and partly from what is seen in the wards and out-patient rooms of hospitals, where every day children are admitted whose joints have undergone complete disorganisation, and who are worn out with pain and long-continued suppuration. Such cases as these, however, convey a highly exaggerated impression of the intractable nature of these affections. It must be remembered that a disease of inflammatory character is very much what it is allowed to become, and the examples I have referred to reach the destructive stage which they ultimately attain, only because they have been left to drift on from bad to worse. In their incipient period these affections are, to a degree which some appear unable to credit, amenable to the influence of appropriate treatment. Take, for example, a case of strumous disease of the hip joint. In its first stage, that is, in the first month or two of its progress, this affection is merely a subacute, slowly developing inflammation, which is undoubtedly obstinate and prone to relapse, but which, on the other hand, if it is met with adequate treatment, will gradually subside without producing deformity, often without involving loss of movement, and very generally without leading to suppuration; while should suppuration occur, it will be remedial rather than destructive (page 412). Now it is much more important to recognise the fact that these scrofulous affections are curable in their early stage than it is to dwell on the destructive changes to which they give rise at a later period. No one would estimate the gravity of a compound fracture at the present day by taking a case in which all the necessary steps of treatment had been withheld. We should turn to an instance in which adequate means had been applied. When we adopt this course, in respect to scrofulous diseases of the joints, we are led to entertain a very much more favourable



opinion than is usually formed regarding them. As obstinate local inflammations, tending to relapse, they call for the application, at the earliest possible moment after they are detected, of two great principles of treatment; first, that of long-continued and perfect rest, which will secure them against the effects both of external injury and of reflex muscular spasm (page 260); and, secondly, the prevention of deformity by the aid of splints and other mechanical supports. When these two conditions are fulfilled, and when the patients are placed under favourable circumstances as to air and food, and are treated with cod-liver oil and other tonics, the cure of these cases, with complete restoration of the functions of the joint is, in a large proportion of instances, simply a matter of time.

It would be unreasonable, as well as futile, to deny that this long expenditure of time is a very serious element. It is distressing to parents to keep a child at rest in the horizontal position for the six or, as it may be, twelve months that are required for the cure of incipient hip disease; or to continue the use of splints for a knee or elbow joint for a similar time. All this may at once be allowed; but the proposition I am anxious to enforce is, that if this care can be taken, and this penalty paid, a cure is generally assured. There are but very few parents who, when the choice is laid before them, will hesitate to carry out this treatment, tedious and difficult though it be, in order that their child may escape the suffering and life-long injury and incapacity that must ensue if the case is allowed to take its course. The objection to the treatment of these cases by long periods of rest which many entertain, namely, that it is prejudicial to the general health, has been greatly exaggerated. There is abundant evidence to show that mere confinement to the horizontal position has, in itself, no seriously prejudicial influence on the patient's health.



As a rule, there can be no doubt whatever that children, whose health has not been already injured by the presence of local disease, will remain, although they are kept at rest, perfectly well, with good colour and good appetite. They will grow rapidly, sleep well, and, possessing as children do a great power of adapting themselves to circumstances, will be contented and cheerful. Often, instead of wasting and growing pale, they gain flesh and colour; especially is this the case when the treatment by rest relieves them of pain in a large joint. I have known many children who have been kept in the horizontal position for eighteen months who have maintained perfect health for the whole period, and who have subsequently borne no trace whatever of confinement. At the Alexandra Hospital, where patients remain throughout the whole course of hip disease, it is easy, by their appearance, to point out which of the patients have been recently admitted and which have been longest in bed, for the former are pale and wasted, as the result of the pain and loss of sleep which the disease has entailed, while those who have been in bed for a twelvemonth, and in whom the disease has subsided, are well-nourished, rosy, and cheerful. The error has consisted in this, that as these scrofulous affections have been regarded as "constitutional" in their origin, it has been held that local treatment is of secondary importance, and that it is absolutely necessary that the patient should have exercise in the open air. It is still the custom with some surgeons to order a child with hip disease to be about on crutches, and to omit all local treatment except that useless proceeding of painting the skin with tincture of iodine. It is very difficult to induce those who take this view of treatment to keep a patient at rest for more than six weeks or two months. It is necessary to state plainly that treatment by active exercise is the reverse of that by which these cases can be

brought to a satisfactory result. It is the method of prolonged local rest that is imperatively called for, while all that is essential in regard to the management of the general health is that the child should be in good air, by the sea if possible, and should be carefully dieted, and should take cod-liver oil and other tonics.

A point of great importance, in respect to these chronic inflammatory affections, is that the tendency to their development (the essence, from a clinical point of view, of the strumous group) is transitory in all but the worst cases. Many children who, when they are between three and eight, develop various scrofulous inflammations, appear, as time goes on, to pass into an entirely different condition of health. They recover from the lesions with which they have been suffering, and subsequently continue perfectly well. In other words, a child who is manifestly scrofulous during a certain period, a period which varies very much in different cases, has ceased to be so a few years later. I have met with several cases in which this subsidence of the activity of scrofulous affections has been very distinct and rapid, so that even in so short a period as three or four months diseases that were of long standing, and that had resisted treatment, have passed off. An example of the kind is given at page 420. Bearing this clinical fact in mind, it is evident that the course to pursue is to treat these diseases diligently and persistently, so as steadily to oppose their advance, and in the case of the joints to be studiously careful to prevent the occurrence of deformity. For if, in the period during which the tendency to chronic inflammation, with the various complications by which they are followed, exists, we are able to avert any results that lead to permanent injury of the joint, we may confidently look forward to the time when the tendency to disease will give place to an equally marked tendency

to repair. That this ultimate tendency to repair is the key to our treatment, and that we may depend upon it, is shown by numerous cases in which, even though disease has reached an advanced stage and has led to suppuration, recovery, often unassisted by treatment, has at length taken place. These are the instances in which we see a hip joint firmly ankylosed, though, as the numerous cicatrices show, many abscesses have been developed, and though great deformity has resulted: or in which caries of the spine, after advancing to the period of extensive angular deformity, has been followed by recovery: or in which, again, all disease has ceased in a knee joint after, unhappily for the future of the limb, irremediable deformity has been allowed to take place. It must always be a matter of regret that the efficacy of repair in these instances has been curtailed or almost neutralised by the deformity which has been allowed to supervene, and that, though the patient has recovered from a serious local disease, he remains crippled for life.

Like other forms of scrofulous disease, affections of the joints most frequently occur between the ages of three and eight. A very large proportion of the cases admitted into the Hospital for Sick Children and the Alexandra Hospital, with hip disease, have been attacked before they were six. The most common period of attack is between three and five. As age increases, the frequency with which these affections make their appearance steadily decreases. They may, however, be developed at any period of life. In the last four years I have met with several instances of well-marked scrofulous disease of the joints in patients of middle age; while in elderly persons these affections are by no means very rare. (*See under Senile Scrofula*, page 121.)

Scrofulous affections of the joints are often provoked by a fall, or other mechanical injury. In many



instances, however, no such cause can be assigned. They frequently follow the exanthemata, particularly measles and scarlet fever. Sometimes they must be regarded as spontaneous in their origin, for they arise in cases in which there has been no previous attack of illness, and in which the patient has been defended from all mechanical injury by having been long confined to bed for the treatment of some earlier scrofulous disease; thus, for example, a child may be seized with disease of one hip joint when he has been in bed for five or six months for disease of the other hip, or of the spine.

While holding that the majority of these chronic inflammatory joint diseases must be regarded as scrofulous in their nature, I must add my conviction that, in many instances, they arise, in children who are otherwise perfectly healthy, merely as the result of neglected local injury. Cases are by no means rare in which, after an injury, one of the joints, in childhood, presents all the symptoms of incipient disease, and yet recovers perfectly in the course of a month if it is kept at complete rest. Such cases, however, it is safe to affirm, would, if they were neglected, gradually assume the features of scrofulous disease.

*Symptoms of scrofulous disease of the joints.*—

The general conception to be formed of these scrofulous affections of the joints is that they are examples of subacute inflammation, beginning, and in all their earlier periods progressing, so insidiously that they are apt to make considerable advance before they are detected. Their symptoms are so slight, and so wanting in any specific feature, that parents, and even surgeons sometimes, are apt entirely to misunderstand their significance. Slight and intermittent lameness, scarcely interfering with free exercise; occasional pain, set down by the mother to rheumatism or growing pains, or put aside as a mere whim;



disturbed and uneasy sleep, with twice or three times in the night a faint cry or whimper, thought to be a nightmare, these are often the only symptoms of the first two or three months of a disease which, unless recognised early and very pertinaciously treated, will at last develop into what we are all only too familiar with as the advanced stage of hip disease, or disease of the knee, attended with suppuration, the formation of sinuses, and irremediable displacement.

**Lameness.**—Lameness in the lower, or impaired movement in the upper extremity, is an early symptom which must never be left without investigation. Sometimes it is constant and obvious, and the child is seen at a glance to be lame; or it is noticed, in the case of the upper extremity, that the patient has a trick for lifting objects, or for feeding himself, which on closer observation is found to be due to stiffness or tenderness of one of his joints. In other cases this lameness or impaired movement is only occasionally seen, when the child first gets up in the morning, or after he has been about all day; while at other times movement is natural, and he runs about as freely as ever. There is nothing whatever that is characteristic in this symptom of lameness, and it may be difficult at first sight to determine which joint is affected; but its mere existence must lead to a full search into its cause.

**Pain.**—The amount of pain, and the period at which it is developed, present wide differences in different cases. In some instances, particularly in the hip, pain is from the first considerable and persistent, is increased by exercise, and leads to night screaming, which cannot fail to excite apprehension. In other cases mothers and nurses are entirely misled by the complete absence of this symptom. Many a parent, when told that her child has disease of the hip or

knee, will dispute the diagnosis on the ground that the child has had no pain. It cannot, however, be too clearly stated that pain is no essential characteristic of either the commencement or the subsequent progress of diseases; and I have often seen a child with advanced synovial disease of these joints walking freely on the limb, without, as the mother stated, any complaint even of uneasiness. Several cases in which it was found that advanced joint disease was present, although no pain had ever been complained of, are mentioned at page 144 *et seq.*

**Swelling.**—In all the joints except the shoulder and the hip, which are so deeply covered with soft parts that unless it is considerable it cannot be detected, swelling is a very important symptom which is almost invariably present, even in the earliest stage. It may be very slight, and only to be detected after very careful comparison, by inspection and measurement, of the suspected with the corresponding sound joint. In the knee, a slight fulness or puffiness at the sides of the ligamentum patellæ, in the elbow, at the back of the joint at the sides of the triceps tendon, is often the only distinct evidence that can be obtained that disease is really present. A few months ago, a boy, aged five, was brought to the out-patient room because he sometimes walked lame. I examined him very carefully for disease of the hip, knee, and ankle, but all these joints moved with normal freedom and without pain. Suspecting that the case might be one of vertebral caries, or of myelitis with slight loss of power, I placed the boy on a chair in a good light, in order to examine his spine. I then saw that there was swelling of the synovial membrane of the ankle on either side of the tendo Achillis, giving the joint an appearance of increased width as seen from behind. On further investigation there was no doubt that the case was one of disease of the ankle joint. In the later stages of

disease, swelling may be due to the formation of abscess within, or in the neighbourhood of the joint, or to brawny infiltration of the surrounding soft parts.

**Defective movement.** — Here, again, is a symptom of the greatest value. It is, in fact, the symptom which is, on the whole, the most constant and the most trustworthy. Its value in the cases of the different joints is alluded to in the special sections, "Hip," "Knee," etc. It is most marked in the shoulder and the hip. In disease of these joints it is seldom or never absent. It is least apparent in the wrist and the ankle; yet even here, when movement is tested at its extreme ranges, some defect will be detected. In short, if a joint moves with perfect ease and freedom, it is very nearly safe to conclude that it is not the seat of even incipient disease. This proposition, however, must not be taken as absolute. Nor must it, in the presence of other symptoms, induce us to omit the further examination of the case when a few days more shall have elapsed. I saw a girl, aged nine, at the Hospital for Sick Children, who, her mother said, occasionally walked a little lame. I very carefully examined her limb and could not detect anything amiss. A fortnight later, however, I found the hip joint completely stiff, and there was appreciable muscular wasting: clearly hip disease was present. It must also be remembered that if a child who has incipient joint disease is kept for a few days at complete rest, especially if a weight has been applied to the limb, every trace of stiffness may for a time disappear, and thus the affection would be apt to be overlooked. A caution must here be given against the practice, sometimes recommended, of using an anæsthetic during the examination of a timid or fractious child for supposed joint disease; for, with the relaxation of the



muscles, both the abnormal position of the limb and the limitation of movement at the joint, the two clearest symptoms, will be removed, and a case whose true nature might with a little tact have been correctly ascertained will probably be overlooked.

**Muscular wasting.**—This symptom is developed to very different degrees in different cases. It is, however, always a very important evidence of disease, and one that is very rarely, if ever, absent when a joint affection has become established. In some instances it is considerable before other symptoms have attracted attention. It may be detected by comparing the circumferential measurement of the suspected, with that of the sound limb, at exactly the same level. But further, even though measurement is the same on the two sides, wasting may sometimes be recognised by the distinctly flabby condition of the muscles in the neighbourhood of the affected joint. Particular groups of muscles are especially affected in the case of the different joints. In disease of the shoulder joint the surrounding scapular muscles which act on the humerus are involved, the deltoid is fattened, and the supra- and infraspinatus muscles are wasted; so that the whole shoulder looks fattened and shrunken in comparison with its fellow. When the elbow is affected it is mainly the muscles of the arm that waste; in the wrist it is chiefly those of the fore-arm, particularly the extensors, and the supinator longus which seems sometimes almost to disappear; in the hip the glutei are wasted, so that the gluteal region is flattened and the gluteal fold is lost. But atrophy is also very clearly marked in the muscles of the thigh, and may be detected by measurement of the two limbs at the same level, without any annoying exposure. In the knee the quadriceps extensor group is chiefly affected, while in the ankle the muscles of the calf are mainly involved. It must be borne in mind that this



symptom of muscular wasting, like so many others that have to be considered in the diagnosis of joint disease, has, taken alone, no diagnostic value. It is a condition met with in many other affections: *e.g.* wasting of the muscles of the calf is found, not only in disease of the ankle, but in infantile paralysis, in flat foot, in congenital dislocation of the hip, etc. It must therefore only be taken as evidence that something is wrong, and must induce us to undertake a complete investigation of the case. This symptom is of value in affording some measure of the severity of the joint affection with which it is associated. When it is considerable and has been rapidly developed it indicates grave disease; when it is slight, notwithstanding that the joint has been some time affected, it is evidence that the disease has not assumed a severe form.

*Treatment.*—In discussing the natural history of scrofula, I have already alluded to the paramount influence which local rest exerts in controlling the advance of the disease, and averting the evils to which it so frequently leads. But I must venture on some repetition here while referring to the general question of treatment. For many years I have had opportunities of carefully studying the treatment of scrofulous diseases of the joints, and I have been led more and more strongly to the opinion so forcibly held by Brodie, Hilton, and Sir James Paget, that by far the most valuable agent is complete and long-continued rest. In a multitude of instances I have seen that prolonged rest has the power of transforming the local manifestations of scrofula, so that instead of obstinately running on into incurable disease, attended with profuse suppuration and irremediable deformity often necessitating excision or amputation, and in the case of the larger joints not rarely proving fatal, these local diseases are kept within narrow and safe limits,

and in the great majority of cases end in satisfactory recovery.

Rest, to be efficient, must be as far as possible absolute, so that the joint is never moved. Obviously, the earlier in the case that rest is secured, the shorter will be the period during which it is required, and the better the ultimate result. The full truth as to the curability of scrofulous joints has been obscured by the fact that in the first place rest is often but very imperfectly maintained, and too soon abandoned; and secondly that these diseases are generally allowed to make considerable progress before they are seriously taken in hand. Parents do not at first realise their gravity, and surgeons are sometimes not sufficiently emphatic in the directions which they lay down, nor always very firm believers in the efficacy of this kind of treatment. Moreover, as I have mentioned above, the very general feeling is that two material drawbacks are attached to this method. First, that the patient's health will suffer from confinement, and secondly, that if a joint is kept for any long period in splints, it will become stiff. Neither of these objections is valid. I have alluded to them at pages 103 and 114, and need therefore only here say that a child who is suffering merely from a strumous joint which has not been allowed to advance beyond the early stage, will remain perfectly well, although confined to the horizontal posture for so long a period as six months, or even a year or more. Children with advanced joint disease are wasted and pale from the pain they have long been suffering, and from the drain involved by chronic suppuration. This is equally the case whether they are allowed to be up and limping about as best they can, or are confined to bed without the necessary means for arresting the local mischief which is telling so seriously upon them. In such cases the result of placing the patient at complete rest, and

adapting the necessary apparatus to the joint, is a rapid improvement of both the joint and the general health.

Secondly, as to stiffness. The doctrine that if a joint is kept in a fixed position it will thereby be rendered stiff, I regard not only as erroneous, but highly prejudicial. I am convinced that no joint ever undergoes ankylosis merely because it is kept at rest. On the contrary, to maintain rest is often the only way in which future movement can be secured. Stiffness results from inflammation, and is due in these cases either to muscular contraction, or to the organisation of the products of exudation. To prevent it, therefore, the proper course is to arrest the inflammatory process. When this is done movement previously lost is generally regained, and the old saying is once more illustrated, *causa sublata, tollitur effectus*. In some instances (alluded to at page 145) the inflammatory process assumes from the first a plastic form. In these cases stiffness will ensue whether the joint is left to itself or whether splints are applied.

In cases that have been allowed to reach an advanced stage there is still much to be done by prolonged rest, but here two additional elements are introduced. These are the occurrence of deformity and the development of abscess. Deformity may be due (*a*) merely to posture, as when the thigh, in hip disease, becomes flexed and adducted, and when secondary distortion ensues, in the form of lordosis and apparent shortening (page 386); or (*b*) it may depend either on destruction of bone, as when the head of the femur and the upper border of the acetabulum are absorbed, and the trochanter is drawn up on the dorsum ilii; or on displacement of the ends of the bones forming the joint, as when, in disease of the knee, the head of the tibia travels backwards and outwards in the popliteal space. In the former case (*a*) the distortion may generally be removed; in the latter (*b*) this may be



impracticable, but even then the patient may recover with a very serviceable limb. As to the treatment of suppuration, the rule I have felt fully justified in adopting at page 411, in the chapter on hip disease, *i.e.* that matter should be evacuated as soon as it is detected, must be strongly advocated in all instances of suppuration resulting from scrofulous joint disease. If this practice is followed, full precautions being taken to prevent the entrance of septic materials, not only will the development of large collections of pus, followed by the formation of profusely discharging sinuses, be avoided, but the process of suppuration will very generally be either arrested or largely diminished, fever will subside, and the wound will either heal or remain as a mere sinus through which there is only a very limited escape of pus. The effect, in checking suppuration, obtained by the removal of pus, is alluded to at page 412. When scrofulous disease has advanced to the stage of disorganisation of the joint, or of extensive caries of the articular ends of the bones, attended with suppuration of long standing, rest, the provision of free drainage, and attention to the general health, may still, if sufficiently prolonged, lead to repair; but in many instances it will be found that no improvement is taking place, and that some further means are called for.

(1) When the joint is the seat of tedious suppuration, it may be opened by free lateral incisions, the diseased synovial membrane may be scraped away or removed with scissors, and drainage secured, the wound being then dressed antiseptically, and the limb maintained at rest on a splint. I have seen many instances in which this method has been attended with success. It is, however, a proceeding that may seriously tax the general strength, especially in the case of a young child, or of a patient who is already in a condition of exhaustion. It is most suitable



for cases in which, though the synovial membrane is extensively diseased, suppuration is not profuse, nor the inflammatory process acute, and in which the patient is above the age of three or four, and not injured in his general condition. Performed in unfit cases, that is, in instances in which disease is acute and the temperature high, or in which the patient is very young or already feeble, it is a proceeding of much danger, and is likely to be followed either by a fatal result, or by the necessity for amputation.

(2) Excision or (3) amputation must be considered. As the grounds for resorting to these means are fully described (*see* page 312 *et seq.*, and page 412) they need not be re-stated here. I will only repeat the caution given at pages 310, 420, that they should be adopted only after careful consideration. Excision, I am convinced, is not rarely performed when it had better be withheld; and I have seen (as have most other surgeons) some instances in which patients, who had been strongly advised to submit to amputation, have subsequently recovered with a very serviceable limb. An example is quoted at page 420.

*Complications.* — These are phthisis, tubercular meningitis, and amyloid disease of the internal organs. It is worthy of remark that patients suffering with scrofulous diseases of the joints are very little liable to phthisis. This fact, which may be observed in the case of the other joints, is especially obvious in the instance of hip disease. At the Alexandra Hospital, where there are always between sixty and seventy children under treatment, and where the subsequent history of the cases is, as far as possible, traced out, phthisis is so rare that sometimes a year passes without the development of more than two or three examples of it.

*Tubercular meningitis.* — Some years ago, when hip disease frequently went on to prolonged suppuration,

this complication was more often seen than it is at present. It is still, however, more common than phthisis. As it is invariably fatal, and as it may come on so insidiously that it is apt at first to be overlooked, it seems advisable to offer a concise description of it.

Tubercular meningitis may arise during any period of the joint affection. In some instances it has occurred within three months. In such cases, however, it ought probably to be regarded as an independent outbreak of tuberculous disease. In some instances it ensues even two or three years after the joint mischief has entirely subsided. Here, again, the direct connection between it and the joint affection may be doubtful. In the majority of cases it arises in the suppurative period of the joint disease, an additional reason for evacuating pus as soon as it can be detected, and for adopting every means within reach for arresting the continuance of its formation (page 411). Cases of meningitis present considerable variety in their method of onset, the symptoms developed, and the period over which the affection extends before the fatal termination is reached.

The symptoms that usually mark its commencement are (*a*) sickness, occurring not only after food has been taken, but spontaneously, when the stomach is empty, and especially when the child wakes in the morning, or after sleep during the day. This sickness often extends over three or four days before any other symptom is present; and it persists in spite of all the means taken to arrest it; (*b*) a slow, irregular, and intermittent pulse, of not more sometimes than 60; (*c*) headache, which may be very severe, intolerance of light, and restlessness, alternating with, and soon followed by, drowsiness; (*d*) obstinate constipation, and marked retraction of the abdomen; (*e*) squint, and, more rarely, irregularity of the pupils; (*f*)

moaning, or calling out during sleep. A very important point is that, in the early stage, and when the difficulty is to distinguish between meningitis and some other intercurrent disease, the temperature, if the case is one of meningitis, will be found to be very slightly raised. Should the temperature be as high as  $102^{\circ}$ , the probability is that the sickness, headache, and restlessness from which the child is suffering are not dependent on meningitis. Instances, however, in which the temperature is considerably raised are occasionally met with. In some cases the disease comes on very rapidly, with constant sickness, intense headache, great drowsiness, flushing of the face, and convulsions. In other cases the early symptoms are very deceptive. The child may make no complaint about his head, and his mental faculties may be entirely undisturbed. In one case, a little girl was joining in a children's service and singing hymns with the other patients within five hours of her death, from constant and severe convulsions, due, as post-mortem examination showed, to acute meningitis. In another, the chief symptom, for four days, was such severe and uncontrollable vomiting that the child was believed to be suffering with intestinal obstruction, due to intussusception, or volvulus coming on after the mother had administered a strong aperient powder. The child was perfectly sensible, and presented no symptom in any way pointing to cerebral affection.

The symptoms that should especially rouse suspicion are sickness, unprovoked by food, slow, irregular, or intermittent pulse, drowsiness or restlessness, together with the absence of any marked rise of temperature. It may be useful to mention that in three cases the symptoms of meningitis have followed immediately on the administration of chloroform given when an abscess resulting from hip disease was,



to be opened. In one of these the child never became fully conscious, but passed from the sleep produced by the chloroform into a drowsy condition, soon followed by other distinct signs of meningitis. In another, sickness persisted for forty-eight hours, and, having at first been ascribed to chloroform, then proved to be the earliest symptom of the meningeal attack. No doubt in both instances brain mischief was close at hand before the anæsthetic was administered, and was merely precipitated by the disturbance of the circulation due to its use.

Once declared, meningitis runs a variable course. It may extend over from a few hours to three weeks, or even longer. In the majority of instances death occurs in from ten to sixteen or seventeen days. The child becomes more and more drowsy, and is soon completely unconscious; sickness usually subsides after the first four or five days; the pulse may still be slow and irregular, or may become more rapid again. Squint, irregularity of the pupils, and convulsions come on; headache may either subside, or continue to be very severe. Paralysis, either of an arm, or a leg, or of one side (often combined with rigidity), or of some of the cerebral nerves, as of the third, or fourth, may be detected. The face is flushed and dusky, the eyes are half open, the conjunctiva insensible and the pupils are fixed. Death may ensue by convulsions, or the child may linger on in a state of unconsciousness for many days, until at length exhaustion leads to a fatal termination.

The *treatment* of tubercular meningitis may, unhappily, be summed up in a very few words. All that can be done is to endeavour to relieve the pain in the head and the convulsions by giving full doses of bromide of potassium; ten grains every six or eight hours may be prescribed for a child of six or seven. A few drops of chloroform may be inhaled when convulsions are severe. Mercury, given



internally, or by inunction, formerly much resorted to, must be regarded as useless, as must also iodide of potassium. I have in former years seen leeches applied, but not with permanent benefit. Nothing is gained by determined attempts to make the bowels act. Medicines given for this purpose often have no other effect than to increase the sickness, and so to interfere with the administration of food. An enema may, however, be used. Milk, with lime water added to it, beef tea, or broth, or other light nourishment, should be ordered.

*Amyloid degeneration* of the liver, spleen, and kidneys may occur as the result of continued or profuse suppuration. The amount of suppuration, however, required to produce it varies very much in different cases. In some patients it ensues when discharge has been going on for only two or three months, and when the drain of pus has never been great. In other cases it comes on only when profuse suppuration has existed for two or three years. In view of this uncertainty a careful watch should be kept in all cases of chronic discharge. Amyloid degeneration is declared by enlargement of the liver and spleen, or of either of these organs, or by the appearance of albumen in the urine. It is attended by gradually increasing pallor, an opaque, waxy complexion, and in the later stages by general anasarca. It sometimes gives rise to diarrhoea, which it is found extremely difficult to check. In the early period of this condition the urine contains only a small amount of albumen, and preserves its normal specific gravity, showing that the excretion of urea is not interfered with. Gradually, however, degeneration of the kidneys ensues, and with an increase of albumen there is diminution of urea and a fall in the specific gravity to 1012°, or even to a lower point. At first, this amyloid change may, if suppuration can be arrested, be entirely repaired, so that the liver and spleen *turn to their normal size*, and albumen disappears

from the urine. The presence of amyloid disease in its early stage is no bar to operative interference, even although the urine may contain a considerable amount of albumen. Indeed, when, in any case of continued suppuration, amyloid disease is found to have set in, the possibility of diminishing the quantity of discharge by operative interference should be fully considered. The removal of sequestra, the provision of more efficient drainage, or, in carefully selected cases, the performance of excision, or amputation (*see* under these headings pages 304, 419), may be followed by complete recovery. In the later stages, however, when the liver has long been considerably enlarged, when the urine contains from a quarter to a third or more of albumen on coagulation and settlement, and its specific gravity is habitually low, and especially when ascites, or general œdema (first noticeable in the eyelids and scrotum), is present, any considerable operation is attended with a largely increased risk; and the healing of any wound that is made will be very tedious. Still, even in these very unfavourable instances, the removal of a sequestrum, or the provision of free drainage, may be followed by considerable improvement.

**Senile scrofula of the joints.**—Sir James Paget, in his “Clinical Lectures and Essays,”\* has a chapter on Senile Scrofula, in which he expresses his belief that the old (that is, people over sixty) are more often scrofulous than those between thirty and fifty, and certainly are more often so than they are generally supposed to be. “The evidences of scrofula in the old are not only in certain diseases of internal organs to which a scrofulous origin may be probably assigned, but in the diseases of the lymph glands, bones, joints, the spine, the testicles, and other structures which appear to be the ‘seats of election’ of scrofula in the young. There is not one of these structures in which

\* 2nd edit., p. 345.

I have not seen, within the last few years, instances of scrofulous disease in people more than sixty years old. The cases appear equally frequent in private and hospital practice, and no period of life is too far advanced for them. Some of the most marked have been in patients over seventy-five; one of them was in a patient ninety-one years old." Senile scrofula of the joints, with which we are now concerned, is still apt to be overlooked, and (at least in its early stage, when treatment is so important) to be mistaken for some simple affection, such as slight rheumatism, that will soon pass off. I shall therefore offer some illustrations of the disease and relate my experience of the cases that have come under my own notice. But the reader should not fail to consult Sir J. Paget's original paper on the subject.

*Case 1.*—The following account is given in the Catalogue of the College of Surgeons of a specimen contained in the Museum.\* "A hip joint in which, after the head and upper part of the neck of the femur had been destroyed by ulceration, the shaft was drawn up, so that the remains of the neck rest upon the ilium just above the brim of the acetabulum. The capsular ligament has been removed; the acetabulum is filled with fibrous tissue. The walls of the femur are very thin and light. From a woman of seventy. Ten years before her death she had an apparently scrofulous affection of her hip. Abscesses, communicating with the joint, opened in the groin, and ultimately the limb became much everted and shortened. The parts, however, ultimately healed. The patient died of apoplexy. After death her lungs and liver were found tuberculous." Short as this description is, it presents us with all the features of an ordinary case of scrofulous hip disease in a child of five or six, and the specimen, which I have often examined, is similar in all respects to many specimens of cured hip disease in young subjects.

\* *Path. Cat. Supplement*, No. 1, No. 936.



*Case 2.*—Four years ago a patient came to the out-patients' room at St. Bartholomew's Hospital for advice about her wrist. She was sixty-two. Nine months before she had sprained the joint while she was wringing a wet cloth. This injury, though she thought very little of it at the time, was followed with stiffness and swelling of the wrist, and by a sense of fulness and uneasiness, especially at night. Within two months after the accident swelling was very considerable and she could not use her hand, and very soon the wrist "dropped," so that she was obliged to support it with the other hand. A fortnight later an abscess formed beneath the extensor tendons and soon burst. The process of suppuration continued, and the joint gradually became disorganised. When I saw the patient the wrist presented exactly the appearance met with in advanced scrofulous disease of the joint in a young subject. The wrist was enlarged; there were three sinuses bounded by protruding granulations and discharging thin flaky pus. A probe introduced, entered the carpal joints in several directions, and everywhere came into contact with carious bone. The joint allowed abnormally free lateral movement. The limb was subsequently amputated. On dissection it was found that the synovial membrane was pulpy and extensively ulcerated, the ligaments were destroyed, and many of the carpal bones were necrosed and quite loose.

*Case 3.*—I lately saw a man, aged sixty-seven, who (together with epididymitis of the left testis, ending in abscess which continued to discharge thin cheesy pus for several months) had disease of his left elbow corresponding closely with scrofulous disease in a child of eight or nine. There were the same indolent, almost painless swelling, the same slow suppuration and formation of sinuses, the same muscular wasting of the arm, and at last the same looseness



of the joint, owing to destruction of the ligaments allowing of free lateral movement. During movement free grating was detected. The patient declined operative interference, and I lost sight of him.

A main feature of this group of cases is their tendency to go on from bad to worse. This is due, in part, to the fact that their real nature is often at first overlooked, so that the necessary treatment is not brought to bear; but, even when the disease is recognised while it is still incipient, and all that is possible is done to arrest its progress, it still, in many instances, continues to advance, or, at the best, admits of only very slow recovery. The tissues, in fact, are already senile, and their powers to repair lesions of this character are to a great degree exhausted. This tendency is much more marked in scrofula of the old than it is when the disease occurs in the young. I have seen some instances in the old in which the affection has, in so short a period as three months, gone on to suppuration and the disorganisation of the joint, changes that in young subjects may never take place at all, or may result only after years of neglect.

*Treatment* consists in at once placing the joint at absolute rest, in well-fitted splints (*see* shoulder, elbow, wrist, etc.), in prescribing residence in a dry and tonic climate, in giving small doses of bark or quinine (cod-liver oil is usually found to disturb the digestive organs in these elderly patients), and in ordering an easily digested and nutritious diet. If matter forms it must be evacuated; but only a small incision should be made, and a strip of guttapercha tissue, instead of one of the large drainage tubes of the day, should be inserted. Should these means fail to arrest the disease, and should the patient's general health become impaired, amputation must, if there is no visceral disease, and if the strength will admit, be performed. Generally this is well borne, and the

wound heals quickly and safely. The operation should be carried out by the method which will, under the circumstances, leave the wound that is at the same time the smallest and the most easily managed, and the patient should be kept in bed as short a time as possible. The ready repair of injuries and wounds in the old, to which Professor Humphry has lately drawn attention, was illustrated in a case in which, some years ago, I amputated through the fore-arm for scrofulous disease of the wrist in a woman of sixty-eight. The wound healed by primary union, and all dressings were dispensed with after the seventh day.

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## CHAPTER IX.

### EPIPHYSITIS.

THE epiphyses at the articular ends of the long bones play a considerable part in the production of diseases of the joints. Like the bodies of the vertebræ, the tarsus, and other cancellous portions of the skeleton, they consist of vascular material, in which cell proliferation and development are in rapid progress during the early period of life. Besides, they are the seat of great additional activity in connection with the growth in length of the bones of which they form a part. This complex formative process involves an instability, as the effect of which healthy nutrition is apt to be supplanted by inflammatory changes, and it is in those epiphyses in which the growth of the different bones is mainly effected (in the lower epiphysis *e.g.* of the femur and the upper epiphysis of the tibia) that morbid action of this kind is most frequently observed. Inflammation of

the epiphyses is often met with in strumous children ; sometimes it is syphilitic, sometimes septicaemic in its origin ; it may result from mere feebleness of nutrition, or be produced either by injury or by exposure to cold and wet. In many instances no definite cause can be assigned. Epiphysitis is essentially an affection of the osseous system. It originates quite independently of the joints. As, however, it is situated in their immediate vicinity, and often even in a part of the bone that lies within the articular capsule, it frequently reaches their interior, and involves them in consecutive disease. Indeed, it is now a well-known fact, that in a very large number of cases of diseases of the joints in childhood (especially in young children) the affection does not originate in the articulation itself, but spreads to it from one of the adjacent epiphyses. Under these circumstances, epiphysitis demands full attention when diseases of the joints are under discussion.

The affection may arise either (*a*) just beneath the cartilage of incrustation ; (*b*) in the neighbourhood of the ossifying centre ; or (*c*) in the line of junction of the epiphysis with the shaft.

In acute cases the inflammatory process rapidly leads to breaking down of the epiphysis, which may be reduced to a mere shell, and sometimes also to destruction of part of the neighbouring diaphysis, and to early suppuration. The resulting pus may burrow in several different directions : (*a*) fortunately, making its way outwards, it traverses the soft parts and points beneath the skin ; (*b*) when the mischief is not confined to the epiphysis, but encroaches upon the shaft, pus may travel for some distance between the bone and the periosteum, the direction which it takes being determined by the fact that the periosteum, while it is firmly attached to the epiphysis, is but loosely adherent to the diaphy



thus is readily detached. In a little girl, aged four years, with acute epiphysitis of the lower end of the femur, matter burrowed beneath the periosteum and stripped this membrane from the whole lower half of the bone, so that when a probe was passed in through the incision made for the evacuation of a large abscess, it was found that the diaphysis was entirely bare. In this case, as in many others, no necrosis followed, the nutrition of the shaft being maintained by its internal circulation. The patient ultimately recovered, though by injury of the epiphysis the growth of her thigh bone was checked, and the limb was ultimately an inch shorter than its fellow; (c) matter may make its way towards, and at length burst directly into the cavity of the joint, with the result of exciting acute general arthritis of a highly destructive character. In some instances ulceration takes place in the line of junction between the epiphysis and the shaft, and the epiphysis becomes completely detached. This is most frequently seen in the case of the head of the femur, which is found lying as a loose sequestrum in the joint, or in the cavity of an abscess. (*See* page 382.) I lately saw a girl, aged ten, who had been attacked three weeks before with acute epiphysitis of the upper end of the tibia. The epiphysis had undergone complete separation from the shaft, and the knee joint was distended with a large collection of pus.

*Acute arthritis of infants.*—Under this title, Mr. T. Smith has described in a valuable paper in the St. Bartholomew's Hospital Report\* a form of epiphysitis which here deserves separate notice. The pathology of the affection is obscure. It appears sometimes to be due to pyæmia, or some other form of blood poisoning, and sometimes to injury during birth, or to a subsequent strain or wrench. Its clinical

\* Vol. x.



features are remarkable. All the instances recorded by Mr. Smith occurred in infants under a year, and in many the patients were not more than two months old; but it is sometimes met with in children as old as two years. It is characterised by its sudden onset and rapid progress as an acute, highly destructive epiphysitis, leading to the formation of an abscess in the articular end of the bone, quickly bursting into and producing disorganisation of the joint (Fig. 15). It is



Fig. 15.—Acute Epiphysitis of the Head of the Femur, with the Formation of an Abscess bursting into the Hip Joint.

very dangerous to life. No less than thirteen of the twenty-one cases described by Mr. Smith ended fatally. When patients survive, they are often left with a shortened, weak, and flail-like joint. The result, however, is sometimes much more favourable, and recovery takes place with very little impairment of the articulation. The disease may attack either only one, or several joints. Mr. Smith relates a case in which both knees, an elbow, and an ankle were

affected. The knee, hip, and shoulder are the joints most often involved. The first symptom is that the joint becomes flexed and stiff. Very soon pain and swelling supervene, and are followed by the distension of the synovial cavity with pus, which, increasing in quantity, is apt to make its way out through the capsule and form a large collection of six, eight, or more ounces in the soft parts round the joint. Should the abscess burst, or be opened, the discharge may cease, and healing may occur; but in many instances death takes place from exhaustion or pyæmia. On post-mortem examination, when the mischief is recent, sometimes a small abscess is found in the

epiphysis, communicating with the joint by a mere pin-hole aperture. In other cases the epiphysis is so excavated that only a shell remains, and a large ragged hole in the cartilage leads into the cavity of the joint, which is filled with pus. Sometimes a sequestrum is present (Fig. 16). At a later stage the epiphysis is completely destroyed, and the end of the bone forms a shapeless stump. Sometimes the acute inflammation going on in the joint involves the opposite bone, so that its articular end also is destroyed. In cases in which recovery from such extensive disease takes place the joint remains flail-like and loose, and the bones, having entirely lost their articular ends, allow very free movement on each other.

As to the frequency with which the disease attacks the different joints, Mr. Smith has recorded twenty-one cases, and to these I have added, in further illustration six, making a total of twenty-seven. In twenty of these one joint only was attacked, while of the remaining seven, in one, four; in three, three; and in three, two were diseased, bringing the total number of joints affected up to thirty-nine. Of these the hip was attacked in fourteen cases, the knee in eleven, the shoulder in five, the ankle and elbow in four each, and the wrist in one. In these numbers we seem to trace a confirmation of the view that the disease is intimately associated, in respect to its origin, with the great activity with which growth is taking place in the ends of the bones. Fourteen cases occurred in the hip, next to the knee the largest and, in respect to the development of the bones, the most complicated of



Fig. 16.—Acute Arthritis of the Tibia showing a Sequestrum in the articular end of the Bone.

all the joints. Eleven affected the knee, the largest of the joints, and that which is formed by the growing ends of the great bones of the thigh and leg. Five were in the shoulder, into the formation of which the growing end of the humerus enters. The remaining nine instances were in joints of a smaller size, and in the neighbourhood of which the growth of the bones is comparatively inactive.

An analysis of these cases clearly shows that this affection is one that is fraught with grave peril both to life itself, and to the joint which is attacked. Of the twenty-seven examples, no less than thirteen, that is about fifty per cent., ended fatally. This result, however, can scarcely be a matter for surprise when the character of the disease, the age of the patient (generally not more than a few months), and the fact that two or more joints may be affected, are borne in mind. In those instances in which the child escapes with his life it is often found that the joint is entirely disorganised, and that the articular ends of the bones are destroyed by ulceration so that the shapeless and truncated stumps, embedded in loose scar tissue, meet each other like the two ends of an ununited fracture. In the elbow this result is not inconsistent with a fairly useful, though flail-like condition of the limb. But in either the hip, the knee, or the ankle, the loss of the joint almost inevitably leads to great and permanent lameness, or may even render the patient unable to bear any weight upon the limb. I have seen several examples in which the head of the femur completely disappeared, and in which the upper end of the bone, formed by the shaft and great trochanter, remained so loosely connected with the pelvis that it could be made to travel freely in any direction, either upwards nearly to the level of the crest of the ilium, or backwards and downwards to the tuberosity of the ischium, or outwards so that it protruded immediately beneath the skin.



This change in the situation of the bone was, of course, attended with a corresponding variation in the length of the limb, which could be drawn down or, as it were, telescoped up through a range of at least three inches. When these patients, as they grew older, tried to walk it was found that, when the weight was thrown on the affected limb, the pelvis sank down upon the femur till the elongated bond of union between the two became tense; but this did not happen till the trochanter was nearly on a level with the iliac crest. Under these circumstances progression was very unsteady and laboured, and very similar to that observed in the worst cases of congenital dislocation of the hip. Indeed these two conditions are very apt to be mistaken for each other. (*See page 143.*)

It may be useful to draw attention to the fact that in instances in which matter has escaped from the joint, and formed a large collection deep in the muscular interspaces of the limb, and when fluctuation may to a superficial examination be indistinct, when large veins are conspicuous on the surface, and when the patient has become wasted, sallow, and feeble, this affection is not unlikely to be mistaken for malignant disease. Several cases have been sent up to the Children's Hospital illustrating this difficulty of diagnosis; and in one instance a surgeon was so firmly persuaded that an infant under his care was suffering from sarcoma of the muscles of the thigh in the adductor region that he declined to allow me to open the abscess, or even to explore the swelling. The result was, the abscess rapidly increased in size, and at length burst; but the child sank from exhaustion.

In one case in which the knee had been affected, and in which I saw the patient fifteen months afterwards, the stump-like ends of the femur and tibia could be moved freely on each other, and were found to give way whenever the child, who was then twenty-



two months old, bore any weight upon the limb. In another instance the upper end of the tibia had slipped backward into the popliteal space, and was overhung by the projecting lower end of the femur, and in this position the two bones were cicatrised together. In another case, mentioned at page 143, the ankle joint had been so absolutely destroyed that the ends of the bones of the leg fitted into a deep socket in the tarsus.

In its *subacute* and *chronic* forms epiphysitis may begin in the cancellous tissue; but it most often originates in the line of junction of the epiphysis with the shaft (Fig. 17). As the mischief advances the interior



Fig. 17.—Epiphysitis beginning at the junction of the Epiphysis with the Shaft, and undermining the connection between them.

of the epiphysis is slowly broken down, pus is formed, and the joint becomes involved either by the extension of inflammation to the synovial membrane from the soft structures surrounding the bone, or by the sudden bursting of matter into the joint cavity (Fig. 18). In the former case the evidences of subacute or chronic synovitis (*i.e.* puffy swelling, limitation of motion, pain on

movement, and, perhaps, heat of the surface) will be added to those already indicative of epiphysitis. (*See* page 137 *et seq.*) In the latter, all the symptoms of a violent arthritis are suddenly developed.

*Case 1.*—Emma B., aged five, was admitted into the Children's Hospital with swelling of the lower end of the tibia of nine months' duration, and a discharging sinus just above the malleolus. The ankle joint was sound. Next day, having been sent for, I found that the child had suddenly awoke during the night *with intense pain* in the ankle, which soon becam-

hot, red, and very swollen. Her temperature in eight hours rose from normal to  $104^{\circ}$ . There could be no doubt what had occurred. Matter, formed in the epiphysis, had burst into the joint. In two days, in spite of free incisions and drainage, the joint was evidently wrecked, and the child was very ill. I therefore performed Syme's amputation. When the joint was opened a sequestrum as large as a Spanish nut dropped out of the articular cavity, and fell upon the floor, and a ragged hole in the cartilage was seen leading into a large carious cavity in the lower end of the tibia.

*Case 2.* — Robert T—, aged five, was an out-patient in 1874, with disease of the lower end of his left femur of six months' duration. The articular end of the bone was enlarged, and there was a small sinus above the

external condyle, discharging thin pus, occasionally mixed with blood. One morning he was brought to the hospital, and his mother said that three days previously the joint had suddenly become extremely painful, and soon considerably swollen. The child was pale, and his face wore an expression of distress. On examination it was seen that the joint was distended with fluid, and the surrounding skin was red and œdematous. Free lateral incisions were made, and nearly an ounce and a half of pus escaped.

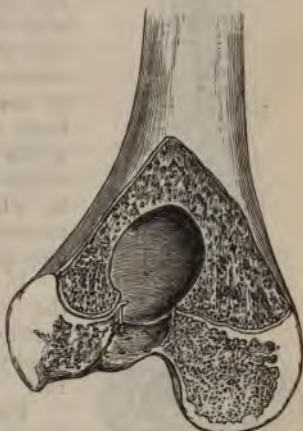


Fig. 18. — Epiphysitis, followed by Abscess bursting into the Joint.

The limb was placed on a splint. Profuse discharge continued; the temperature was  $101^{\circ}$  to  $104^{\circ}$ , and the patient quickly lost flesh. A week later amputation

was performed. On dissection all the evidences of acute destructive inflammation of the joint were observed. An opening, one-third of an inch long, with thin ragged margins, was seen in the articular cartilage, covering the external condyle of the femur. This led to a large cavity in the epiphysis, which extended to the junction of the epiphysis with the shaft, in which situation extensive ulceration had evidently been long in progress.

In some cases, not only is the epiphysis in great part destroyed, but necrosis of the diaphysis may occur. (See Fig. 19.)

For a description of syphilitic epiphysitis, see page 158.

Chronic epiphysitis often lays the foundation of very intractable joint disease, especially in the knee. Cases are frequently met with in which

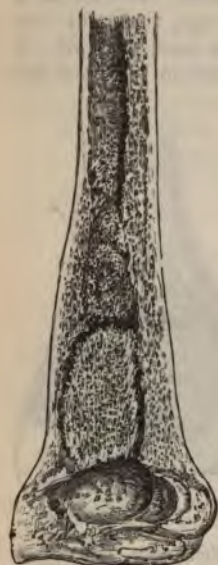


Fig. 19.—Necrosis of the Cancellous Structure of the Lower End of the Tibia following Epiphysitis.

children of eight or ten, or even young adults, are found to be suffering with joint disease which originated in extension of chronic inflammation from one of the adjacent epiphyses when the patient was only two or three years old, and which, though there have been periods of remission, or even of apparent recovery, has several times relapsed. In



these instances the joint gradually becomes stiff, and often deformed, and liable, on any increase of exertion or disturbance of the health, to a renewal of synovitis more or less acute. Ann P., aged 23, was lately in the hospital with synovitis of the right knee, attended with severe pain and an evening temperature of 103°. A scar was seen at the back of the external condyle of the femur. The lower end of the femur was enlarged. She stated that her knee had been diseased ever since she was three years old, and that, from time to time, the scar gave way and matter escaped. She had frequently been confined to bed with long-continued pain in the knee. After admission she continued in severe pain, and a few days later the old scar became inflamed, and soon gave way, and half an ounce of pus escaped. On examination under chloroform I found that a probe entered the external condyle, and defined a cavity about as large as a walnut. A week subsequently the knee was intensely painful, considerably swollen, and hot to the touch. The skin on the inner side of the patella was red and œdematous, and pitted on pressure. On gentle pressure over the knee pus escaped from the sinus. The patient was put under chloroform, and the sinus which clearly led into the joint was dilated by the introduction of a strong pair of forceps and the forcible expansion of the blades. About an ounce of pus was let out from the articular cavity. From this time the patient lost her pain, and her temperature fell in a few days to normal. In three weeks the sinus had nearly closed. She afterwards left the hospital, wearing leather splints; but the sinus was still discharging. The joint admitted considerable movement. The sup-puration within the joint was, no doubt, due to a renewed attack of inflammation in the lower end of the femur.

In two of his best-known papers, the one entitled



"Necrosis of Joints" and the other "Chronic Abscess in the Extremity of the Tibia," Sir Benjamin Brodie has left on record how perfectly familiar he was, from a clinical point of view, with the forms of disease which have recently been classed under the head of acute and chronic epiphysitis. His cases of necrosis of joints were examples of epiphysitis in which the articular cavity had become involved; while his cases of chronic abscess of the tibia were, for the most part, instances of very chronic epiphysitis, with the formation of matter pent up in the cancellous tissue. Thus, as an example of epiphysitis involving a joint, I may quote his case of J. G., a boy aged 9, admitted into St. George's Hospital in 1814. One knee was much enlarged, painful, and tender when handled, the leg was partially bent on the thigh. It was said that he had met with an injury seven years before, and that from that time the joint had not seemed to be quite in a sound state. He had not suffered much from it till within the last four or five weeks, when the knee became suddenly swollen, and the seat of pain, which confined him to bed. As suppuration occurred round the joint, amputation was performed. "In making a section of the femur through the condyles an abscess was found in the middle of the bone, in which lay a piece of dead bone of the size of a walnut. The sinus extended from this cavity downwards into that of the knee joint, communicating with the latter by an opening in the space between the two condyles." And no clearer description of chronic epiphysitis leading to abscess in the articular end of a long bone can be given than that recorded by Sir Benjamin Brodie, where he relates the case in which he first recognised and described this condition of chronic abscess in the end of the tibia. Mr. P., æt. 24, consulted him in 1824. There was considerable enlargement of the lower end of the right tibia, extending two or three inches from the ankle

joint. The integuments at this part were so dense that they adhered closely to the bone. The pain was constant, but at times there were such severe exacerbations that the patient's sufferings were described as very great. They confined him to his room for several days, and were attended with considerable constitutional disturbance. The disease had existed twelve years, and had rendered the patient's life miserable. Amputation was performed. The patient unfortunately died in five days, evidently of acute septicæmia. On making a section of the lower end of the tibia, the bone was found to be greatly thickened, and unnaturally hard and compact. In its centre, about  $\frac{1}{2}$  of an inch above the ankle, there was a cavity of the size of a walnut, filled with dark-coloured pus. The bone immediately surrounding this cavity was distinguished from that in the neighbourhood by being of a whiter colour and a still harder texture; and the inner surface of the cavity presented an appearance of great vascularity. The ankle joint was free from disease. Although these cases of chronic abscess in the articular ends of the bones are now recognised as for the most part examples of epiphysitis with the slow formation of matter, they are sometimes met with, as the result of local injury, in persons in whom the epiphyses have long been united to the shaft.

*Symptoms.*—The symptoms of acute epiphysitis are usually characteristic when they are carefully investigated. The articular end of one of the long bones becomes painful and tender on pressure, often over some particular spot. The soft parts covering it are swollen, and the skin may be suffused with a faint blush, but it frequently presents its normal appearance. There is often distinctly increased heat of the surface. The patient does not use the limb, and the joint is maintained in a position of slight flexion. Swelling generally is limited to the neighbourhood of the affected

bone, but sometimes, even from the first, the joint is puffy and enlarged. The disease rapidly advances, and it soon becomes clear that suppuration has occurred. The resulting abscess may be present beneath the skin, or, by burrowing beneath the periosteum, give rise to swelling, œdema, and fluctuation extending in the limb to some distance away from the joint. Should matter burst into the articular cavity, the evidences of acute arthritis will immediately supervene.

The symptoms attending subacute and chronic epiphysitis are often in the early stages of the affection so obscure that they are apt to be overlooked. When the mischief is seated in the mid-substance of the epiphysis, and is advancing slowly, the only symptoms will be slight pain, especially when the limb is being used, slight heat on the surface, and a disinclination on the part of the patient to move the joint. When the affection is more advanced, there is swelling about the articular end of the bone, with tenderness on pressure and pain on movement, and an habitually fixed condition of the joint. Swelling increases, and at length fluctuation, due to the formation of matter, can be detected. Should the abscess be allowed to discharge itself spontaneously, a sinus will remain, through which pus continues to escape. Accompanying these symptoms, swelling of the synovial membrane, with pain, and sometimes heat of the surface, may be detected as evidence that the joint is involved. A probe, cautiously introduced, is found to pass through the substance of the epiphysis into the immediate neighbourhood of the joint, and will often disclose the fact that the whole articular end of the bone has been reduced to a thin shell enclosing a large cavity containing either a sequestrum or a number of loose fragments of carious bone. Should matter suddenly enter the joint, the



symptoms of an acute general arthritis will be at once developed. (*See cases 1 and 2, pages 132, 133.*)

In some cases, a small abscess formed beneath the articular cartilage may burst into the joint in connection with epiphysial disease of such limited extent that its presence has never been suspected. In such instances, the real origin of the acute arthritis which follows is very likely to escape detection.

*Treatment.*—In acute epiphysitis, the imminent danger in which the joint is placed is the main fact to bear in mind, and steps must be taken, without a moment's delay, to provide for the safety of the articulation. The limb must be placed at absolute rest by the use of efficient splints, and, even in the case of the upper extremity, and as a matter of absolute necessity in the case of the lower, the patient should be confined to bed. I have, on several occasions, applied one or two leeches when the child was strong, and when the epiphysitis was in its early stage, with the result that inflammatory action has subsided. Leeches should not, however, be used in children under two, or when suppuration has taken place. The part should be covered either with lead and opium lotion, or with a light poultice. Should the child's temperature remain high, or should any part of the end of the bone present marked tenderness on pressure, and should there be circumscribed redness of the surface, especially if this is combined with œdema, so that there is pitting on pressure, chloroform should be given, and an exploratory puncture made with a tendon knife, under precautions against septic infection. It is of paramount importance that pus should be let out as soon as it has formed. The removal of half a drachm, or even of fifteen drops, and subsequent drainage, may save the joint and avert an injury to the epiphysis that would be followed by arrested growth of the limb. Should matter be found



travelling beneath the periosteum of the shaft, it must be at once evacuated by free antiseptic incision. When pus has burst into the joint it must immediately be let out by lateral incisions, drainage must be secured, and the wounds must be treated antiseptically. In cases in which not only has the joint become acutely inflamed, but the epiphysis is found to be separated, or in which the shaft of the bone is the seat of acute necrosis, the question of amputation must be considered. Should the general health remain good, should the temperature not be above  $102^{\circ}$ , should the child be not rapidly losing flesh and strength, and should the discharge be healthy and only moderate in quantity, the operation may be delayed; for when free drainage has been secured, repair that was at first despaired of has, in several cases I have met with, at last taken place. Should the temperature remain above  $102^{\circ}$ , should the child be growing weaker, and should discharge be copious and unhealthy, amputation must be performed. A great danger in these cases is that of pyæmia from septic infection. The best chance that this may be avoided lies in the early and free evacuation of matter, and the use of drainage and antiseptic dressings.

In the *Acute Arthritis of Infants*, the same rules must be followed. The joint must be kept at rest by the use of suitable splints, and matter, as soon as it is detected in connection with the epiphysis, must be forthwith let out by a careful incision. If matter has entered, or formed in the joint, it must be at once evacuated. Undoubtedly the early removal of pus, which if allowed to remain will lead to the entire destruction of the epiphysis, and also of the joint, is often followed by an immediate arrest of the destructive process and the ultimate recovery of completely free, or of scarcely impaired, movement of the joint. I have seen this result occur even when

the knee joint, for instance, has contained as much as an ounce of pus. If it is found that the ligaments are destroyed, so that the articulation admits of abnormally free movement, great care must be taken, should the patient survive, to prevent deformity. For general treatment all that can usually be done in these young children is to see that they are amply supplied with milk, and with small quantities of well-prepared beef-tea, or pounded raw meat, and with half an ounce of brandy in the twenty-four hours, to be given in doses of ten to twenty minims at frequent intervals; while sometimes a few minims of *liquor cinchonæ* may be given every six hours; and when there is much pain a quarter or half a minim of tincture of opium should be prescribed.

In subacute and chronic epiphysitis, prolonged rest with fixation of the joint is demanded. The part must be kept in splints just as it would be if the joint itself were the primary seat of disease. If this rule is adequately carried out, though the case may extend over several months, recovery will be the usual result, and often suppuration will be avoided. Should matter form, it must be evacuated without delay. In any case in which matter has already formed, and has discharged itself through a sinus that has remained unclosed, a careful exploration should be undertaken for the purpose of ascertaining whether a sequestrum is present. If a sequestrum exists it must be removed; and care must at the same time be taken that pus has a free exit to the surface. To secure this, a sufficient amount of the superficial wall of the bone must be cut away. The interior of the cavity of the epiphysis, however, should not be gouged. This may lead at the time to perforation of the joint, or be followed by an accession of inflammation, in the course of which the articulation may become involved.

**Symptoms of chronic abscess in the**

**articular end of a bone.**—This condition is most common in the lower end of the tibia, but it has been met with in the upper end of this bone, in the lower end of the femur, in the upper and the lower ends of the humerus, and occasionally elsewhere. When the abscess is small, and buried in the mid-substance of the bone, the only symptom, generally, is constant pain, attended with exacerbations, usually occurring at night, and increased by previous exercise. Sometimes the bone is slightly enlarged. When matter is nearer the surface there is usually some spot to which pain is especially referred, which is tender to the touch, and sometimes so sensitive that the patient will not allow even the slightest pressure over it. This "tender spot," often also soft, is very characteristic. In this situation there is often some slight swelling of the soft parts. These symptoms, though each when viewed alone may seem very slight, are yet, when taken together, and when, moreover, they persist in spite of treatment calculated to relieve neuralgia or rheumatism, conditions which this affection most resembles, the presence of chronic abscess may be suspected.

*Treatment.*—Under these circumstances, the proper course will be to endeavour to hit upon and evacuate the collection, by making a crucial incision down to the bone and perforating its substance with a small trephine applied over the "tender spot" or wherever there is any trace of swelling or of yielding of the wall of the bone on firm pressure. If the first exploration is not successful in reaching matter, the instrument may be introduced at some other spot, or a fine gouge may be cautiously used to perforate the bone in different directions. When the abscess cavity is found it should be laid freely open and allowed to granulate from the bottom, being in the meantime syringed out, so that its interior is maintained free from decomposing pus.

When epiphysial disease attacks that end of the



bone at which elongation of the shaft is mainly accomplished (*e.g.* the upper end of the humerus or the lower end of the femur) subsequent growth may be considerably interfered with. I lately saw a young woman, aged 20, who had suffered with acute arthritis of her shoulder joint when she was an infant, and whose arm was now five inches shorter than its fellow. In other instances, not only is growth arrested, but the joint is useless. In a girl, aged nine, who had acute arthritis of the left ankle when four months old, the left leg was three inches shorter than the right, and the ankle gave way, so that the tibia came to the ground, when she tried to walk. As she could wear no support, I amputated the leg. On dissection, the malleoli were found to have disappeared, and the truncated lower end of the tibia was fitted into a large cup-shaped hollow formed in the tarsal bones, which had to a great extent been destroyed. In another case, the head and neck of the femur, and apparently also the acetabulum, had disappeared, and the stump-like upper end of the femur shifted about loosely on the dorsum ilii, as it may be observed to do in some cases of congenital dislocation. (*See* page 240.) In a girl, aged four, the leg was an inch and a half shorter than its fellow in consequence of epiphysitis in infancy affecting the upper end of the tibia.

But, instead of producing atrophy, epiphysitis may, if slight in degree and continued over a considerable period, lead to increased length of the limb as the result of persistent and abnormally free blood supply to the epiphysal cartilage. A boy, aged nine, had had, when I saw him, disease of the knee and enlargement of the lower end of the femur for three years. The limb was very nearly an inch longer than its fellow. In another case, of chronic synovitis of the knee joint, with increased vascularity of the ends of the bones, the limb was an inch and a half longer than the opposite.



## CHAPTER X.

## QUIET DISEASE.

It is notorious that scrofulous diseases of the joints are often developed so slowly and insidiously, and are in their early stage so devoid of characteristic symptoms, that they are apt to be overlooked or mistaken for slight rheumatism, or growing pains, or even for a trick. The obscurity in which the early symptoms of these affections are involved is so deceptive that it may be worth while, in order to place beginners in practice fully on their guard, to relate some illustrative cases, in order to show that these diseases may reach even an advanced stage without raising, in the minds of parents and relatives, any suspicion of their presence. Sir James Paget\* has described what he has termed "quiet necrosis," in which "all the essential facts of the process of necrosis, the death of the bone and its exfoliation, and the formation of new bone, may take place without any attendant phenomena either of inflammation or fever." The cases of joint disease which I am about to relate closely resemble those of quiet necrosis, in the absence of the symptoms which usually attend inflammation. There is no pain to attract attention, no tenderness, and but very slight swelling. The chief symptom being slowly increasing stiffness, which parents wholly misunderstand, or perhaps entirely overlook.

*Case 1.* A girl, nine years old, who had been kept for six months at complete rest, for the treatment of caries of the dorsal spine and coexisting hip disease,

\* "Clin. Lectures and Essays," p. 339. 2nd edition.

complained that she could not move her elbow. On examining the joint, I found it almost absolutely stiff, slightly swollen, and a very little hotter than the opposite joint. The muscles of the upper arm were much wasted. On inquiring of the mother, I learnt that the patient had never complained of pain, but had been noticed for three months to be awkward in feeding herself, and bending her limb oddly at the wrist, but there was no suspicion that the elbow was diseased and had become stiff. Six months later the joint, which had in the meantime been enclosed in splints, was free from all signs of disease, and looked quite normal, but it was absolutely fixed. For the past four years it has remained thus ankylosed, possibly by bone, but more probably by very close and firm fibrous adhesions. I believe the case to have been one of inflammation of the synovial membrane, in which the exudation products, instead of breaking down as they commonly do in scrofulous inflammation, became organised in the same way as they do in urethral arthritis (page 24), or after sharp attacks of traumatic synovitis.

*Case 2.*—A boy, aged eleven, was brought to the Hospital for Sick Children in 1881, for what his mother thought was some affection of the spine, which had become much arched forward in the lumbar region. On examination it was seen that the left hip joint was completely stiff and flexed at an angle of about  $120^{\circ}$ , and that there was considerable wasting of the glutei and other muscles of the limb. The curvature of the spine was merely compensatory. I found on careful inquiry that the boy had never complained of pain about the hip, and it was difficult to convince his mother that it was this joint, and not the spine, which was the seat of disease.

*Case 3.*—A man, aged twenty-three, who belonged to a very strumous family, observed that his right hip and left shoulder were gradually becoming stiff, and

that the muscles about the hip were wasting. There was no pain in the shoulder, and very little in the hip. On examining the joints under ether it was found that they were firmly fixed. An attempt was made to restore movement in the shoulder by separating the adhesions and employing manipulation; but, though some slight movement was produced, stiffness rapidly returned, and the treatment was discarded. Both joints have now long been fixed, but they give no pain, and show no other evidence of disease. Other examples of the same kind are not rarely seen in children between four and twelve, in whom the shoulder joint is found to have become stiff, though none of the other signs of disease have been observed. I have many times seen attempts made to restore movement in these cases, but never with success. Never having had an opportunity of dissecting a joint thus affected, I cannot say what are the precise changes that have occurred, but, judging from clinical observation merely, they consist of plastic inflammation of the synovial membrane, leading to the rapid removal of the articular cartilage, and to either bony or very close fibrous ankylosis. The shoulder joint is more commonly involved than either the elbow or the hip. I have seen several instances in which this condition has followed injury of the elbow due to a fall, and in which stiffness has been the only symptom observed. In some of these, the children have been sent to the hospital with the report that they were suffering with muscular rigidity following injury, and the joint affection has escaped notice. These cases in their early stage are the more deceptive, because under an anæsthetic the joint will move freely and smoothly, although stiffness returns when the effects of the anæsthetic pass off. Indeed, in two or three instances, the opinion that they were instances merely of a spasmodic condition of the *muscles*, had led to the repeated use of forcible



movement, the effect of which had been to induce pain, heat, and swelling in the joint, as the result of an accession of acute inflammation. In the hip all the usual symptoms, except stiffness, may be so entirely absent that for many months no suspicion of the real state of the case is excited. Even on close inquiry it cannot be ascertained that the child has ever complained of pain, and all that has been observed has been that he has had a peculiarity in his walk. On careful investigation, however, a correct diagnosis may be easily arrived at. Stiffness is, so far as I have observed, always a marked symptom. This may be only partial, but often it is almost complete. In the shoulder, when an attempt is made to rotate the head of the humerus in the glenoid cavity, it is found that the scapula moves with the humerus; and the same is noticed when the elbow is moved forward or backward, or is drawn away from the chest. The muscles, especially the deltoid, are wasted. In the elbow swelling may be detected, though it is often very slight; there may be distinct rise of temperature of the surface, but this is neither marked nor constant; the joint is more or less stiff, both as to flexion and distension; and supination and pronation are sometimes entirely lost. There is also invariably muscular wasting, and when the case is of long standing this wasting is very marked. In the hip often the only symptoms are stiffness (*see* page 145), and muscular wasting, to be detected both in the gluteal region and in the thigh. I know of no condition apart from joint disease, in which rigidity involving the muscles surrounding a single joint comes on thus spontaneously, or from injury, and persists, while all the other muscles of the limb remain in a normal state. In other words, the explanation of such rigidity always is that the contraction is reflex and dependent on disease of the joint.

*Treatment.*—The treatment of these cases of quiet



disease must be the same as that of ordinary scrofulous mischief. The parts must be kept at absolute rest, in the manner described under the head of the different joints. If this course is not followed, and the cases are neglected, the disease will go on to develop into a well-marked example of scrofulous inflammation of the joint, ending in suppuration and deformity. If rest is persistently maintained, the joints will in many instances ultimately recover, and regain complete, or considerable movement. In some instances, however, the inflammatory action is followed by rapid organisation of adhesions, so that (as I have said) the joint may become permanently ankylosed within three or four months. It is these latter cases which have given rise to the view that if joints are kept at rest they will become fixed. Such instances, however, are, it is highly important to bear in mind, entirely exceptional. Generally when complete rest is enforced, it is followed by the subsidence of inflammatory action, the absorption of lymph, the cessation of muscular spasm, and, at length, restoration of movement. This restoration is sometimes only partial, but often it is complete.

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## CHAPTER XI.

### SYPHILITIC DISEASES OF THE JOINTS.

SYPHILITIC diseases of the joints have hardly received the attention they deserve at the hands of English surgeons. Very few cases (I refer to the affection in adults) have been reported, and in some of the recent standard works on surgery and surgical pathology the subject is not even mentioned. Both Lancereaux in *France*, and Bumstead in *America*, however, have

described these affections, and recorded illustrations of them. They are, I believe, much less rare than is generally supposed, and I think there is good reason to believe that some instances of joint disease which resist treatment by the usual methods of rest, blistering, etc., and which show an obstinate tendency to relapse, are really of this nature. It is easy to see how the cases may have been overlooked, for having been mistaken for subacute rheumatism (which they closely resemble), and having been treated with iodide of potassium, a drug that enjoys a considerable reputation in rheumatic affections, their disappearance gives rise to no remark. Or they have occurred in association with some other and well-marked syphilitic manifestations, and having been regarded merely as incidental rheumatism, and having subsided under the treatment prescribed for the lesions that were clearly specific, there has been nothing to excite a suspicion as to their true character. It must also be remembered that post-mortem examinations of the subjects of active syphilitic disease are comparatively rare.

The following account, which agrees in the main with the descriptions given by Lancereaux and Bumstead, is drawn from cases that have recently occurred in St. Bartholomew's Hospital.

The joints may be attacked during either the secondary or the tertiary stage of constitutional syphilis, and also in the inherited form of the disease.

Three main varieties have been met with in adults.

1. During the period of the earlier secondary skin eruptions, ulcers on the tonsils, plastic iritis, etc., one or more of the joints may be affected with a subacute or chronic synovitis, attended with moderate effusion, and in all respects resembling rheumatic synovitis of a like grade of severity. No post-mortem examinations of joints in this condition have yet been recorded; but

there is no reason for supposing that any special changes would be found.

*Case 1.*—Thomas T., æt. 19, was admitted into St. Bartholomew's Hospital, on September 7, 1885, under my care, suffering from a stiff, swollen, and painful knee joint. He stated that two years previously he had acquired syphilis and since that time had frequently suffered from various secondary constitutional affections. Three weeks before coming under notice his right knee became swollen and stiff, with shooting pains in it, especially at night time. Latterly the symptoms had increased in severity.

*Present condition.*—A rather emaciated and cachectic looking lad. He has numerous pigmented scars on his body and legs. On the shins are recent and painful nodes. Both testes are the seat of well-marked syphilitic inflammation. They have been enlarged since January last.

Except for a few months after inoculation the patient has had no treatment for syphilis.

*Right knee.*—Is in an extended position, and cannot be completely flexed. Movement causes slight pain. The joint is a little swollen, though in an irregular fashion. The synovial membrane on each side of the ligamentum patellæ feels thickened and pulpy; that of the upper part of the joint appears to be in a healthy condition. There is no general elastic bulging of the synovial membrane, as in strumous synovitis. There is slight excess of synovial fluid. No thickening of the tibia or femur can be detected. The patient was ordered a twelfth of a grain of perchloride of mercury, and five grains of iodide of potassium three times a day. In a week much of the swelling had disappeared, and in three weeks the joint was quite sound and well, the nodes on the tibia had diminished, and the testes were smaller. He was so much improved, a few days later, that he was



made an out-patient, and shortly after he ceased to attend.

*Case 2.*—A man, æt. thirty-two, came to the out-patient room at St. Bartholomew's Hospital for the treatment of secondary eruptions and a sore tongue, six months after he had contracted syphilis. His right elbow joint was painful, moderately swollen, partly from thickening of the synovial membrane and partly from fluid, estimated at about three drachms, and partially stiff. The skin over the joint was very slightly hotter than normal. He was ordered a twelfth of a grain of perchloride of mercury, and five grains of iodide of potassium. Under this treatment he rapidly improved. The skin eruptions disappeared in about three weeks, the ulcers on the tongue healed, and at the same time the elbow became much less painful and swollen. A fortnight later the joint had returned to its natural condition. Six months afterwards, he came with a node on the right tibia, a sore tongue, and with the elbow swollen, stiff, and painful especially at night. Under the same treatment as that first adopted the node disappeared, the sores on the tongue healed, and he lost the pain in the elbow, which became much less swollen. The joint, however, remained rather stiff. From this time I lost sight of the case.

*Case 3.*—A woman, aged thirty-six, was under treatment in the summer of 1885, with sore throat, cutaneous rash, and two small gummatous swellings in the subcutaneous fat over the biceps in the front of the arm. Her right elbow joint was swollen and painful, as if the seat of subacute rheumatic synovitis. She was pale and emaciated, and had miscarried six weeks previously. Under iodide of potassium and bark all her symptoms disappeared in a month, and the elbow had returned to its natural size, and had recovered free movement. The patient had gained flesh and strength. She then ceased to attend. Three



months later she returned. She was again very ill. She had a large subperiosteal node on the middle of the ulna, and the elbow joint was again stiff, painful, and swollen. Under the use of iodide of potassium and quinine she at once improved, and the node and the joint affection slowly disappeared. Three months later, however, she was attacked with hæmoptysis, and I afterwards learnt that she died in the autumn of rapidly advancing phthisis.

2. In the later stage of constitutional syphilis, during the period of tertiary nodes, rubial ulcers, and gummata, the joints may be attacked with more severe forms of syphilitic inflammation. One or more of the joints may be affected, and the larger articulations apparently are more often involved than the smaller ones. The disease, in some instances, begins as a syphilitic infiltration of the deeper layers of the synovial membrane, and extends into the synovial and adjacent tissues, in places taking the form of definite gummatous nodules. The endothelial lining of the joint is not itself diseased, but is bulged towards the cavity of the articulation by the irregular inflammatory products beneath it. In some instances the synovial membrane has the appearance, when the joint is opened, of being half an inch or even an inch in thickness. Effusion, always limited in its amount, is often entirely absent. In some instances inflammation and enlargement of the articular ends of the bones is also present.

*Case 4.*—H. C., æt. thirty, was admitted into St. Bartholomew's Hospital on Nov. 16th, 1885, under the care of Mr. Willett, suffering from painful swellings of several joints. In 1878 he had a venereal sore, followed, after an interval of some months, by a skin eruption. Since that time he had remained well, until fifteen months before his admission. At this time his left ankle began to give him pain at night, and after five or six weeks became swollen. Three

months later the left great-toe joint was similarly affected, and after three months more the left knee. Six weeks before coming under notice, the left knee began to give him trouble. In all the joints the pain was at first felt only at night, but afterwards continued throughout the day.

There was no history of syphilitic disease in his family, and none of gonorrhea or rheumatism.

*Condition on admission.*—The skin over the left great-toe joint and the left ankle is tense and shiny. The lower end of the tibia is distinctly enlarged, but the fibula is natural. There is some limitation of movement in the ankle joint, and swelling on the inner side and in front of the articulation. The head of the metatarsal bone of the great toe is enlarged, and the movements of the joint are limited. Over both of these joints pressure causes pain.

The left knee is swollen, and measures one inch more in circumference than the right. It cannot be quite completely extended. There is no fluid in the synovial cavity, but the synovial membrane feels thickened and pulsy. The fovee on each side of the patella are partially obliterated. The patella is irregular in shape and increased in size by formation of new bone around its margins. The internal condyle of the femur is considerably enlarged by the formation, apparently, of new bone. There is very slight pain on movement, unless an attempt is made to fully extend the leg.

Four days after his admission into the hospital, a very distinct syphilitic node appeared on the patient's forehead. He exhibited no other evidences of syphilis. Iodide of potassium and mercury were now administered, and the swellings of the joints, as well as the node on the forehead, at once began to diminish. In a fortnight the left knee had diminished in circumference half an inch, and by Dec. 9th the patient could walk well without pain, though the swelling had

not all disappeared. On Jan. 9th, 1886, after continued treatment, the swellings of the left knee and ankle had still further subsided, and, as far as the synovial membrane was concerned, the joints appeared natural. Some bony thickening, however, remained.

Although the right knee caused him pain on

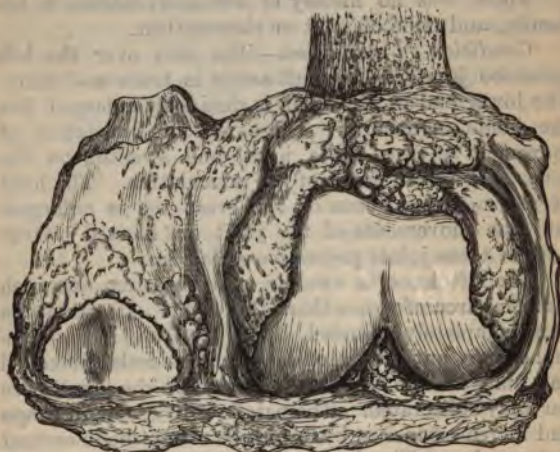


Fig. 20.—Syphilitic Disease of the Knee Joint. The subsynovial tissue, thickened and tubercle from gummatous exudation, bulges the synovial membrane itself towards the cavity of the joint. The lower end of the femur is inflamed and roughened.

admission to the hospital, it presented no evident signs of disease, and all pain in it passed away simultaneously with that in the other joints.

In this form of disease, as *post-mortem* examinations recorded by Lancereaux show, the synovial fluid becomes turbid from the admixture with inflammatory products. The cartilages may become eroded, and the ligaments softened and destroyed.

3. Arthritis, in another group of cases, begins in

the ends of the bones, and subsequently spreads to the soft tissues of the joint. In these instances the articular extremities of the bones are enlarged, and the patients complain of severe neuralgic pains, especially at night, resembling those experienced in specific osteitis elsewhere. The examination of the knee joint of a patient who died in the course of the year 1885 in St. Bartholomew's Hospital, under the care of Mr. Savory, showed (Fig. 20) that the periosteal disease, attended with the formation of new bone, was precisely similar to that met with in other situations.

I have lately seen two cases, both in women affected with tertiary syphilis, in whom, with extensive gummata deposited in the subcutaneous fatty tissue around and below the knee, there was some stiffness of the joint, and very obvious thickening of the synovial membrane and effusion into the cavity of the articulation. In one, the gummata had broken down, and led to the formation of a number of large and deep ulcers, running together in the shape of a crescent below the joint. In the other, the patella underwent necrosis, and almost the whole bone came away in three or four large fragments. In both, the disease extended over many months, and showed a strong tendency to relapse, in spite of full courses of iodide of potassium. In these cases the joint affection was secondary to gummatous disease in the neighbouring soft parts.

*Symptoms.*—The first variety of the disease presents itself in the early period of the secondary stage, and consists of a subacute, slowly advancing synovitis, attended with stiffness, swelling, and sometimes tenderness of the affected joint, but with no alteration in the appearance of the skin, and with very little heat or pain, though the patient may complain of nocturnal neuralgia about the articulation, and in the adjacent bones. The enlargement of the joint, due to



effusion, is generally not very marked, but in some instances it is considerable. A peculiar feature in these cases is the manner in which the amount of effusion fluctuates, sometimes nearly disappearing, then returning, and remaining long stationary, and then perhaps undergoing a considerable increase. No other change in the synovial membrane is apparent than that of slight and slowly increasing thickening. Often even this cannot be detected. In short, the affection presents itself as a subacute synovitis, with no very distinctive characteristics. Hence the real nature of these cases is, as already said, apt to escape detection.

In the second and much better marked variety, depending on gummatous infiltration of the sub-synovial connective tissue, and described by Richet as "syphilitic white swelling," the joint is considerably enlarged, and the thickening of the synovial membrane can readily be made out, while here and there distinct gummatous nodules may often be felt. The affection is very indolent in its progress. In the later stages grating, due to erosion of the cartilage, may sometimes be made out, and movement may be gradually considerably impaired. Suppuration is rarely met with. The joints that appear to be most often attacked are the knee, the elbow, and the ankle. I have seen no instances in the hip or the shoulder.

Thirdly, when the disease commences as osteitis of the articular ends of the bones, the cases assume the same features as those just described, except that the enlargement of bone is much earlier and more distinctly marked, and nocturnal pains are much more severe.

*Diagnosis* turns on the history of the case in respect to syphilitic infection; the presence of other specific manifestations, or the scars of bygone attacks; the *irregular*, and sometimes distinctly nodular, thickening

of the synovial membrane; the enlargement of the articular ends and adjacent portions of the shafts of the bones; the existence of nocturnal pains; the absence, in many cases, of previous rheumatic disease. Yet distinctive characteristics are often wanting in these cases, and error and oversight can only be avoided by bearing in mind that syphilitic joint affections are not rare, that they resemble rheumatic disease, and that they must be suspected when any joint in a syphilitic subject becomes, without any obvious cause, and apart from previous rheumatism, the seat of chronic enlargement, and the other symptoms above-mentioned, which do not yield to non-specific remedies.

*The treatment* consists in the administration of the iodide of either potassium or sodium. I have been led to prefer the iodide of sodium, on the ground that, as Professor Sydney Ringer has taught us, while its action is as markedly beneficial as that of the iodide of potassium, it is far less depressing than the latter drug. The doses of the two are the same. The quantity of iodide given should, if necessary, be gradually increased up to fifteen or twenty grains, taken three times a day. In cases occurring in the early period of the secondary stage, or in obstinate examples in the tertiary period, mercury, best given in the form of the perchloride, should be combined with the iodide of sodium. In cases in which the ligaments are becoming softened, or in which the disease advances in spite of the use of anti-syphilitic drugs, it is necessary to place the joint at complete rest by the use of appropriate splints. Probably the local application of mercury, in the form either of the oleate, or of the *unguentum hydrargyri*, would be of service.

Sir James Paget has lately mentioned to me two cases in which syphilitic synovitis of the elbow joint occurred in patients who were the subjects of chronic gout. The affection, in both instances, was very

indolent, and showed a strong tendency to relapse. Both patients, however, ultimately recovered; under long courses of mercury prescribed in small doses, and combined with remedies for gout.

In infants the subjects of congenital syphilis the articular ends of the long bones are liable to a remarkable form of disease. From the end of the diaphysis a fungating growth, the result of low inflammatory action, takes place, consisting for the most part of a soft granulation tissue, which gradually separates the epiphysis from the shaft, so that mobility and crepitus, as if fracture had occurred, may sometimes be detected. In many cases there is no suppuration, and the joints themselves may remain free from disease. The tendency of the affection to undergo repair when mercury is prescribed is very marked.

In the more severe cases, however, suppuration occurs, and, as the result of ulceration, the epiphysis becomes entirely broken down, and matter either bursts into the joint, or collects in the soft parts in the neighbourhood of the epiphysis. The ends of the bones, at which growth principally takes place, are the most frequently attacked. The nature of the disease is generally disclosed by the existence of other lesions of a syphilitic character.

These syphilitic affections in the neighbourhood of, or involving, the joints are usually met with in infants between the ages of two or three months and two years. They may, however, occur in the first month after birth. They are often multiple. They are characterised by node-like swellings of the epiphyses and adjacent part of the diaphyses, producing considerable enlargement, and attended with tenderness and a minor degree of pain.

*Treatment* consists in the use of mercury, in the form either of one grain of *hydrargyrum cum cretâ*



twice daily, or of inunctions of the *unguentum hydrargyri*.

Should deformity be threatened, a light splint must be applied. If matter is detected it should be evacuated. These affections usually soon yield to treatment; but the mercurial course should be continued for two or three weeks after the symptoms have disappeared, in order to guard against a relapse, which otherwise is prone to occur. In weakly infants, however, if several joints are involved, death by exhaustion is by no means rare.

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## CHAPTER XII.

### THE JOINTS IN HÆMOPHILIA (THE HÆMORRHAGIC DIATHESIS).

HÆMOPHILIA, according to the valuable researches of Dr. J. Wickham Legg and other observers, is met with in England chiefly, though not exclusively, in individuals of German descent, and is confined to males. Female members of bleeding families, though they frequently transmit the disease to their male offspring, do not themselves suffer with it. The main character, I may remind the reader, of the affection is that its victims, who are often termed bleeders, are liable, as the result of a wound, or even a slight abrasion, to continuous oozing of blood from the broken surface, which it may be difficult or impossible to arrest.

They are subject also to obstinate spontaneous hæmorrhages from the various cavities that are lined with mucous membrane (viz. the interior of the nose, the mouth, the lungs, the stomach, and the intestinal



canal, the blood being either vomited or passed by the bowel), and the kidney or bladder. Though the sufferers from this affection are sometimes brought to death's door by the large hæmorrhages that recur at varying intervals, it may be of several years, the bleeding usually at length is arrested; yet many fatal cases have been recorded. An example is related in the Transactions of the Pathological Society (1885), by Dr. Legg, in which a boy, aged nine, died in St. Bartholomew's Hospital of epistaxis, under the care of Mr. Langton, hæmorrhage having persisted for five days, in spite of plugging the nares and all other means that could be thought of to arrest it.

It is in the course of this formidable, yet obscure disease that the large joints may be the seat of hæmorrhages into their synovial cavities, either spontaneous, or resulting from an injury, such as a blow or a wrench. The knee, elbow, and ankle, so far as I have seen, are the articulations most often involved. In the case above mentioned Dr. Legg has given a description of the condition of the two knees and the left ankle, which I copy *in extenso*, as it affords the best account of this kind of articular hæmorrhage that I am acquainted with. "The changes in the joints differ in degree, so that the ankle shows the earliest, and the right knee the more advanced effects of the disease. Fresh, dark blood, with a small amount of clot, is found in the ankle, without any structural change in the joint: the cartilage is pink from *post-mortem* staining. In the left knee no recent blood is found; but its traces are seen in the deep russet-brown colour of the lining membrane. The cartilages preserve their pearly white aspect. At the under surface of the external femoral condyle, where it meets the pressure of the tibia, the cartilage is worn, thin, and granular over a space of half an inch in diameter. The ligaments are unaltered. In the right knee the connective

tissue of the joint is also deeply stained of a brown colour ; but the changes in the cartilage are far more advanced. The cartilage is wanting over the point of pressure, and bone thinly covered by cartilage has developed at the periphery of the joint. At the under surface of the femoral condyle, about the central parts, the cartilage is thin, worn, and rough. It is fissured in various directions, and laminated. It has lost its close attachment to the bone, so that a knife can be passed beneath it here and there for the distance of two or three lines. The edges of this partly detached cartilage, when raised, are seen to be ragged and fibrous, and split into layers like that in the joint of chronic rheumatic arthritis. Around each condyle is a prominent bit of bone, somewhat nodular, and thinly covered with cartilage. The same description holds good for the articular surfaces of the tibia and patella. In the femur there is a gap in the cartilage of the external condyle on its front surface. The gap extends to the bone. The edges of the cartilage bounding the gap are smooth and rounded. Mr. Bowlby reported that, under the microscope, the cartilage showed fibroid degeneration of the hyaline matrix, with multiplication of the cells and breaking up of their capsules. The minute, like the grosser changes, bore a marked resemblance to the alterations which take place in rheumatoid arthritis. The joints are in the museum of the hospital (No. 740, B, C, D), and there is a microscopic section of the cartilage (Series lv., No. 539)."

In the case of Charles S——, a boy of nine, apparently of pure Irish descent, who died under Mr. T. Smith in St. Bartholomew's Hospital, in 1881, of hæmorrhage from a slight wound of the lip, Dr. Legg reports that there had been swelling of the right knee when the boy was a year and nine months old, which had subsequently remained more or less marked. When

the boy was six his ankle suddenly became swollen, and an incision made, in one of the London hospitals, to which he was taken, was followed by bleeding for a week. On *post-mortem* examination the knee was found to have become slightly flexed. The patella was fixed to the front of the femur by a slight adhesion; the cartilage on the patella had been absorbed and replaced by fibrous tissue. The synovial membrane was stained of a yellowish brown colour. The ends of the bones, where not covered with cartilage, were coloured in like manner. The cartilage preserved its usual appearance. A similar condition was found in the right ankle.

These cases, which are far more complete than any that have previously been published (I know of no other specimens than those above described), show that the joint affections met with in hæmophilia are the result of synovial hæmorrhage. These hæmorrhages produce more or less articular swelling (which, though it usually slowly subsides, is sometimes permanent), and are followed by a low form of inflammation and the development of adhesions, by which movement is interfered with or entirely prevented; and also by degenerative processes, consisting of fibrillation and absorption of the cartilage and other changes closely resembling those met with in osteo-arthritis. If supuration ever occurs it is certainly very rare.

*Symptoms.*—While bleeding is already taking place elsewhere, or as the first event in a hæmorrhagic attack, one of the joints (the knee is a convenient example) is found to be the seat of a suddenly developed enlargement, sometimes only amounting to a slight puffy swelling, but often distinctly fluctuating, and evidently caused by fluid in the synovial cavity. There is little increase of heat; but the joint is often painful on movement, and tender, as *if affected* with subacute rheumatism. Subsequently



the swelling gradually subsides, and the joint may entirely recover; but in many cases puffiness and stiffness, varying in amount in different cases, remain, and are accompanied by frequently relapsing pain and tenderness, which prevent the patient from walking. In some instances the joints become more and more impaired by repeated hæmorrhages and the inflammatory attacks to which they give rise.

*Treatment.*—In respect to this the importance of recognising the nature of these cases must first be pointed out. An oversight may lead to a fatal result. Indeed, Poucet\* records a case in which a boy, aged eight, died of hæmorrhage, following the application of the actual cautery to the joint; and Charles S— (page 161) bled for a week from an incision made into his enlarged ankle joint. The danger of overlooking the disease is greatest in cases in which joints have been damaged by repeated slight relapses, unattended with hæmorrhages from other parts. In the case, therefore, of male patients suffering from obscure subacute relapsing swellings of the joints, resembling subacute rheumatism or osteo-arthritis, inquiry as to the presence of hæmophilia should always be instituted before any proceeding involving a breach of surface, even by a blister, is adopted. Fortunately, parents, or the patients themselves, are generally so alive to the dangerous consequences of a wound that they mention the fact that they are bleeders.

The best course is to keep the limb at rest on a splint, to apply evaporating lotions or ice, if hæmorrhage is still going on, and subsequently to cover the joint with mercurial ointment and a Martin's india-rubber bandage not too firmly applied. Gentle frictions and massage may be used if swelling remains indolent; and the patient should walk with a crutch

\* *Lyons Gazette Médicale*, 1871, tome viii. pp. 785, 798.



or a stick, so as to avoid the chance of wrenching or spraining the joint. Aspiration of the joint, with even a fine needle, must certainly not be ventured upon, nor should blisters be used. Iodine liniment, not, however, strong enough to produce much irritation of the skin, may be applied. During attacks of hæmorrhage from other parts, any joint that has already suffered ought to be scrupulously guarded against even slight mechanical injury.

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## CHAPTER XIII.

### DISEASES OF BURSAE.

It may be useful to introduce this subject by a brief reference to the anatomy of the bursæ, near the principal joints, which are liable to become diseased, and to require surgical treatment. Their position, and the fact whether or not they communicate with the interior of the articulation, are the two main points respecting them.

**The shoulder.**—There is a large bursa under the deltoid, which runs for some distance beneath the arch formed by the acromion and the coraco-acromial ligament. It rests on the supra- and infraspinatus muscles as they pass to be inserted into the greater tuberosity of the humerus. Though it usually does not, it nevertheless may, communicate with the joint. The large bursa between the subscapularis and the neck of the scapula is formed by a direct prolongation of the synovial membrane through an opening in the capsule. So far as I know, this bursa is never the seat of disease calling for active treatment.

**The elbow.**—The bursa about the elbow of most importance from a surgical point of view is that over

the olecranon. It has no connection with the joint. The bursa situated beneath the insertion of the triceps into the olecranon is usually small ; but is occasionally enlarged, so as to project upward between the tendon and the back of the humerus. It does not communicate directly with the joint, but it is so near the capsule that great caution would be required in treating it. In persons much engaged in writing, and whose left elbow rests on the table, and is thus subject to pressure, a bursa may form over the internal condyle. I recently saw such a bursa as large as an egg. These bursæ are free of the joint.

**The wrist.**—There are various bursæ in connection with the different tendons. The “ganglia” that occur on the dorsal aspect are familiar to all. So also is the compound palmar ganglion, in connection with the flexor tendons. None of these communicate with the wrist joint. They must, however, be very carefully treated, otherwise inflammation may occur, and result in damage to the free action of their associated tendons.

**The hip** presents the large bursa that lies between the ilio-psoas tendon and the front of the capsule. It generally communicates with the interior of the joint, through an opening which is often of considerable size. Another bursa is that between the gluteus maximus and the great trochanter. It is often large and multilocular. Another bursa lies over the tuberosity of the ischium. Neither of these two involves the joint.

**The knee.**—Here are numerous bursæ ; but only some of them are of any surgical importance. That most often diseased is the bursa patellæ. It lies over the patella and up part of the ligamentum patellæ. It has no connection with the joint ; but see page 169. Two others lie upon the front aspect of the knee. One is placed beneath the quadriceps extensor muscle, just above the condyles. It varies very much in size,

but is sometimes very large. It communicates freely with the synovial cavity. The other is beneath the ligamentum patellæ at its insertion into the tubercle of the tibia. Though not connected, usually, with the synovial membrane, it is so close to it that it must be handled very cautiously. In the popliteal space is the bursa beneath the semimembranosus muscle. It rests on the internal condyle of the femur and the inner head of the gastrocnemius. It so frequently communicates with the interior of the knee that a puncture of it must be considered as probably equivalent to a wound of the knee joint. The orifice of connection is, no doubt, often small, but there are no means generally of ascertaining what the size of the opening really is. There is a bursa lying beneath the sartorius and other muscles as they pass around the inner part of the head of the tibia. It has no connection with the joint. In the neighbourhood of **the ankle** the only bursa constantly present is that beneath the insertion of the tendo Achillis into the back of the os calcis. It is not very rarely enlarged. It is wide of the joint. Bursæ are occasionally met with in connection with the peroneal tendons, or with those which pass around the inner ankle. They do not involve the joint.

The diseases to which bursæ are liable are chiefly of an inflammatory type, and are usually produced by mechanical injury. In many cases, owing to repeated attacks of slight inflammation, the interior of the bursa becomes occupied by fibrinous exudation, and considerably enlarged, as in the ordinary instance of an enlarged bursa patellæ. At the same time, owing to slow deposition and organisation of fibrine on its inner surface, the wall becomes thickened and indurated. In some instances the process gradually leads to the obliteration of the cavity of the bursa, and its conversion into what is virtually a lowly organised



fibrous tumour. Sometimes the bursa remains as a thick walled and dilated sac, containing shreds and ragged fragments of fibrine, which are gradually changed by pressure into melon-seed-like bodies, similar to those so often found in ganglia, or fibrine may become organised, into tendinous cords or bands. In other cases bursæ become acutely inflamed, and constitute tense and very painful swellings, attended, as in the instance of the bursæ over the olecranon and the patella, with inflammation of the surrounding skin. Bursæ are occasionally the seat of inflammation of either rheumatic or gouty character. These affections, especially the latter, are attended with excessive pain, and entirely prevent the use of the limb. I recently saw a patient who, two days after he was attacked with acute gout in the right great toe, was seized with intense pain in the left heel. On examination, I found the inflammation was clearly situated in the bursa beneath the tendo Achillis; the tendon itself was normal. I have also seen acute gout of the bursa under the ligamentum patellæ. Sometimes bursæ are affected with syphilitic disease. A patient three years ago in the out-patient department of St. Bartholomew's Hospital had a large irregularly lobed or tuberoso swelling over the great trochanter of the femur, together with tertiary eruption and a node on his tibia. The swelling subsided gradually under the use of iodide of potassium in ten-grain doses, at the same time that the node and skin eruption disappeared. There seemed no doubt the case was one of syphilitic enlargement of the subgluteal bursa.

In another group of cases, bursæ become distended when effusion takes place into the joints with which they communicate. This is best seen when the bursa under the semimembranosus in the popliteal space enlarges as fluid collects in the knee joint. In some of these instances the condition of things is at once



apparent; the joint is obviously distended, and fluctuation between the joint and the bursa can be distinctly felt. In other cases, however, the joint may be so little swollen that the fact that it is involved, and that the bursa is filled from it, may, unless care is taken, be overlooked, with the result that a diseased knee or other joint is unwittingly opened.

*Treatment.*—This must turn upon the age of the patient, the size and position of the bursa, the circumstance whether it does or does not communicate with the joint near which it is situated; and upon the presence and absence of inflammation.

In the management of bursæ free from inflammation in children and young adults, the best method is to place the limb on a splint so as to maintain rest, to puncture the bursa and evacuate its contents, and to apply pressure. This plan may be safely adopted, if due care is used, even when the bursa communicates with the joint, as is the case with that under semimembranosus muscle. In adults this is also the best procedure, except in the old, or when there is a communication with the articulation. In patients above the age of forty-five, puncture had better, as a rule, be avoided. The limb should be placed on a splint to keep the bursa at rest, and the superjacent skin should be sharply blistered with the ointment of the biniodide of mercury, rubbed in every morning or often enough to produce the desired amount of irritation; or ordinary blistering fluid may be used. This treatment must, in some cases, be continued for a month or five weeks. The method of painting the surface lightly with tincture of iodine, or of applying the ointment of iodide of lead is, as a rule, quite useless. In adults, when the joint is involved, puncture must either be avoided, or be resorted to only when other means have failed, and when every

possible care to exclude septic agents has been taken. When a bursa, *e.g.* that beneath the semimembranosus, is filled from the neighbouring joint, treatment must aim at the removal of the joint effusion, for no direct treatment of the bursa itself will be of service. When bursæ, as the result of repeated attacks of inflammation, have become converted into what are virtually fibrous tumours, or when, though they still preserve a considerable cavity, their walls are thick and callous, they may, if their relations to surrounding parts permit, and if they are free of the joint, be dissected out. This proceeding is appropriate where these solidified, or thick-walled bursæ are situated, for instance, over the olecranon, the tuber ischii, or the patella. In the last case, the operation must be performed with care, for where the bursa projects laterally, so as to pass beyond the sides of the ligamentum patellæ, where the joint capsule is extremely thin, the articulation will be opened if the knife is used at all freely. There is, indeed, a tradition that a surgeon, when he had completed the removal of the bursa, discovered that he had removed the patella also.

When bursæ are inflamed, they must be opened as soon as matter has formed, as indicated by increased swelling, pain, and tenderness, by the appearance of inflammation of the skin, and by the occurrence of dusky redness, œdema, and pitting of the surface on pressure. In cases of doubt, an exploratory puncture with a hypodermic syringe should be made. If incision is delayed, the distended sac will give way subcutaneously, and pus, unable to escape upon the surface through the thickened integument by which bursæ are generally covered, will become extravasated into the neighbouring areolar tissue, and lead to wide-spread cellulitis. Every year, cases are seen in the hospitals in which, from the rupture of

an over-distended bursa patellæ, the whole vicinity of the knee has thus become the seat of diffuse suppuration, rendering extensive incisions necessary, and producing a condition of parts from which recovery is always tedious and slow.

## CHAPTER XIV.

### ON THE FORMATION OF CYSTS IN CONNECTION WITH THE JOINTS.

THE above forms the title of two excellent papers by Mr. Baker, in the *St. Bartholomew's Hospital Reports*,\* in which the author has described a group of cases which had previously not attracted the attention they deserve. The first case related was originally under my own care, and, as it will serve to illustrate many of the chief features of the disease, I will report it in some detail. A woman, aged 38, was admitted in July, 1873, with a large swelling in the calf of the right leg. The limb was slightly cedematous, the superficial veins were dilated and tortuous; and the leg from the ankle to the knee was twice as large as its fellow. The swelling was nearly uniform, but was especially marked in the calf, where deep-seated fluctuation could be detected. There was some effusion into the knee joint. The patient complained of very little pain or tenderness in the limb. She said that the swelling had commenced after a slight injury five months previously, and had continued slowly to increase. Two or three days after her admission I punctured the calf with a fine trochar, and drew off several ounces of a translucent, pale red,

\* Vol. xiii. p. 245, and vol. xxi. p. 177.

viscid, alkaline fluid, containing chlorides, and a large amount of albumen ; but neither pus nor blood. Considerable thickening of the upper part of the calf remained. The fluid quickly re-formed beneath the gastrocnemius, but then gradually diminished again,



Fig. 21.—Cyst in the Popliteal Space connected with the Knee Joint.

so that in September it was noted that there was "still some thickening in the upper part of the calf." From the date of her admission the patient was unable to retain either urine or feces, which she passed involuntarily. Towards the end of September she was discharged, but it was observed that the knee had



gradually become much swollen, and that the leg had assumed a position of abduction and eversion. In August, 1874, the patient was admitted under the care of Mr. Baker, who was then acting for Mr. Callender. The swelling of the knee had to a great extent subsided; but after a fall, two months previous to her admission, the leg had been "out of place," and had become loose, and quite useless. There was little pain. The tibia was now dislocated outwards and backwards, and the leg was loose and flail-like, so that it could be replaced in fair position, though deformity returned as soon as restraint was removed. The synovial membrane was very much thickened; the bones grated as if the cartilage was lost; there was no pain or tenderness even on free movement. The whole extremity was wasted. No trace of the former swelling of the calf could be detected. In January, 1875, Mr. Callender amputated the limb. On dissection the joint surfaces were found in great part denuded of cartilage, smooth and eburnated, and "lipped" from the growth of nodules of bone around their margins. Portions of the cartilage that remained were soft and pulpy. The ligaments had been almost entirely destroyed. The synovial membrane was thickened. The joint contained a considerable amount of viscid fluid. When this case was originally under my care I had seen no instance of (so-called) Charcot's disease, page 80, and I regret that no observations as to the presence of locomotor ataxia were made. The rapid manner, however, in which the disease had been developed, the character of the fluid drawn off, the subsequent absorption of the remainder, the disappearance of the swelling, the disorganisation of the knee joint, and the incontinence of the urine and fæces, all these features induce me to regard the case as one in which the joint disease was probably associated with *tabes dorsalis*. It very closely resembles the examples which Charcot has described as

the acute form of the disease which passes under his name.

In another case (I quote from Mr. Baker), a patient, aged 53, was admitted under Mr. Holden in 1875, having a month previously noticed a swelling in the calf of his right leg, especially prominent at the upper and inner part, three or four inches below the knee. This was punctured by the house surgeon, under the belief that, as there had been redness and tenderness, it was an ordinary abscess in the calf. A greasy fluid, containing flakes of lymph, but no pus, escaped. Suppuration followed the puncture, and the knee joint a few days later became tensely distended, and, on pressure being made over the articulation, fluid escaped from the puncture. It was thus evident that a free communication existed between the joint and the cyst in the calf. The fluid discharged consisted of pus mixed with synovia. Subsequently the material flowing from the opening resembled synovia. The wound slowly healed, and the patient left the hospital a month later, with the knee somewhat flexed and stiff. On examining him at the end of a month from that date, Mr. Baker found the joint in a condition similar to that observed in osteo-arthritis. There was some swelling; flexion and extension could be performed through a considerable range; there was grating on movement; and the ligaments were weakened or in part destroyed, so that the tibia admitted of free rotation. The joint was so weak that the patient could not walk on it.

In his second paper Mr. Baker has recorded the formation of similar cysts in the neighbourhood of the shoulder, elbow, and hip. A man, aged 24, had a swelling about as large as a hen's egg in the middle of the arm in front of the biceps. This, which had the appearance either of a cyst or a chronic abscess, was punctured. About two ounces of fluid, straw-coloured,

and mixed with curdy lymph, escaped. For three or four days a good deal of clear fluid drained from the puncture. On the fifth day the patient complained of pain in his arm, and his temperature rose to  $104^{\circ}$ . Pus now flowed from the wound. Next day the patient complained for the first time of pain in the shoulder. Mr. Baker now suspected the real nature of the case. On questioning the patient it transpired that he had felt pain and stiffness about the shoulder joint for many weeks before his admission. About two months later the patient died of cerebral disease. No detailed description of the dissection of the limb was recorded, but there was no doubt at the time that the synovial fluid had made its way from the shoulder joint to the middle of the arm by tracking in the course of the long tendon of the biceps muscle.

A man, aged 40, was in the hospital, under the care of Mr. Savory, in 1885, with a distinctly fluctuating swelling on the inner side of the elbow, about an inch above the internal condyle. This swelling, which was somewhat larger than a pigeon's egg, was fixed to the deeper structures. The elbow could not be extended beyond an angle of  $120^{\circ}$ , nor be fully flexed. The swelling had been first noticed about six months previously, and had so rapidly increased that the patient at once applied as an out-patient. The arm was placed in a splint, and lead lotion was applied. By continued rest the arm so far improved that the patient returned to work; but a week before admission he again suffered pain and swelling, and the arm could not be extended. A few days after he came in, the tumour was punctured, and about three drachms of thin, glairy, and curdy fluid escaped. At the time the swelling almost disappeared; but as, a few days later, it had re-accumulated, another opening into it was made, when some yellow glairy fluid escaped. The patient shortly afterwards left the hospital, wearing a



plaster-of-Paris bandage on the arm. In July, 1886, this patient returned to the hospital. The elbow joint was found to be extensively diseased, and Mr. Savory performed excision. At the operation the synovial membrane was in a state of pulpy degeneration. The ligaments were softened and the cartilages destroyed by ulceration.

A man, aged 34, of rheumatic descent, felt pain in the left hip and knee in 1874. This increased and prevented his being at work in 1876. In 1877 he came into St. Bartholomew's Hospital, under Mr. Thomas Smith. The left hip and knee were stiff, and there was an indistinct sense of fluctuation, as of deeply seated fluid below Poupart's ligament. In 1883 he was again in the Hospital. The knee was still stiff. The hip was fixed and everted, and the limb was shortened by three-quarters of an inch. The whole front of the thigh as far as its middle was occupied by a large hemispherical cyst, fluctuating throughout, and measuring seven inches in its transverse, and seven and a half inches in its vertical diameter. It was tapped, and forty-two ounces of yellow alkaline fluid were drawn off. A month later it was tapped again. In 1884 the tapping was repeated, and forty ounces of fluid, evidently synovial, were drawn off. A note in March, 1885, states, "He can still get about, and walk two miles. He has lately had more pain. There are pains and creaking noises in both shoulders. The cyst is filling again."

Mr. Norton\* has recently described "gangliar disease of joints." In this affection, in a woman of forty, he observed a large ganglionic swelling extending from the wrist, on the dorsal aspect of the limb, to the middle of the fore-arm. There was evidently fluid in the wrist joint; the hand hung down and the patient was unable to raise it. As the

\* *British Medical Journal*, vol. ii. p. 413; 1884.



disease was increasing, and the hand was quite useless, Mr. Norton performed amputation. On examination he found the large ganglionic swelling extended into the wrist joint. The ligaments were distended so as to allow free lateral movement. All the bones of the carpus were rarefied and so softened that a knife could be easily pushed into their substance. The articular cartilage was thinned. In 1885 I had under my care, in St. Bartholomew's Hospital, a woman, aged 34, both of whose wrist joints were stiff, and distorted with the ordinary features of osteo-arthritis. In both fore-arms ganglionic swellings of considerable size and apparently multilocular extended for some distance on both the palmar and dorsal aspects of the limb. I believe this case was similar to those recorded by Mr. Norton, the important point in all being that the ganglionic swellings communicated with the wrist joint, a connection not present in the instance of the common ganglia associated with the sheaths of the tendons in this situation. Mr. Walsham has lately had under his care in the hospital a child, aged seven, with an affection of the right foot. Seated over the instep were three fluctuating tumours of the size of walnuts, presenting the character of bursal swellings, but not apparently communicating with each other. On puncturing one of them Mr. Walsham let out the usual glairy fluid contained in ganglia. On introducing a probe the instrument plainly entered the ankle joint.

The main clinical point in this group of cases, and it is a highly important one, is that swellings presenting the characters of a cyst may possess an entirely unsuspected connection with one of the large joints, with the result that their puncture may be followed by inflammation of the articulations with which they are associated. Several examples of this disaster have been recorded, and in some of these amputation has been required. The manner in which

these synovial cysts are formed is well illustrated by the case recorded by Mr. Baker (*see* page 175), in which, as the result of disease of the shoulder joint, synovial fluid had tracked its way along the tendon of the biceps to the middle of the arm. The primary joint disease appears often to be of the nature of osteo-arthritis. This is, however, by no means invariably so. In the case first noticed, I think, the affected knee was the seat of Charcot's disease, while in one instance (in Mr. Walsham's case) the patient was a child, and the exact nature of the affection was obscure. Probably further observation will show that these cystic swellings may be occasionally met with in any instance in which joint disease is attended with effusion into the synovial cavity. The feature that should be most carefully borne in mind is that there is often nothing to indicate or even suggest the connection of the cyst with the joint, nor any *prima facie* evidence of joint disease. The cyst may be at a considerable distance from the articulation; there may be no intervening swelling; there may be no effusion into the joint; there may be, and commonly is, no fluctuation to be obtained between the joint and the cyst, and fluid cannot be pressed from the cyst into the joint. In fact it is here, as in so many other instances, impossible to avoid falling into a very serious error, unless the surgeon is forewarned by having become familiar with these cases, either by personal experience or by having had the advantage of reading such clear and full accounts as those which are contained in Mr. Baker's papers.

In a valuable communication to the Pathological Society\* Mr. D'Arcy Power, curator of the museum, St. Bartholomew's Hospital, has given the results of the dissection in four of these "intermuscular synovial cysts," in which their origin is discussed. In some

\* Vol. xxxvi. p. 337.

instances fluid, the result of effusion into the joint, escapes either into some bursa (often that under the semimembranosus) which communicates with the articulation, or through a hernial protrusion of the synovial membrane (Fig. 22). In some cases, however,



Fig. 22.—Cysts connected with the Knee Joint. (After Billroth.)

enlargement of the bursa seems to precede the joint disease, and to be its predisposing cause; and Mr. Power showed a cyst in connection with the shoulder joint, which appeared to have existed before any disease of the articulation was present.

The *treatment* of cystic swellings of this character must be very carefully managed, and must have reference, not only to the tumour itself, but also to the joint disease with which it is associated. Fluid may be safely evacuated if the same care is taken that is



used in the removal of a loose cartilage to prevent the introduction of septic agents, and if the limb is maintained at rest upon a splint. The puncture should be made with a small sized trochar and canula on the first occasion; but if fluid is thick and curdy, or if "melon-seed-like bodies" are present a free incision and drainage may be required. The treatment of the affected joint must vary with the case, and can be determined only when a careful diagnosis has been arrived at. It is important to notice that in several of the cases the disease progressed to the entire destruction of the joint.

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## CHAPTER XV.

### LOOSE BODIES IN JOINTS.

Loose bodies found in joints are of the following kinds:

1. Masses of fibrine condensed and roughly pressed into shape. These are either mere hardened portions of blood clot, or fibrinous concretions derived from inflammatory exudation, and resembling the melon-seed-like bodies met with in bursæ.

2. Blood effused into a synovial fringe may become organised, and form a pedunculated body, which, when its stalk gives way, falls loose into the joint cavity. A few years ago, one of the St. Bartholomew's Hospital football players violently sprained his knee. The accident was followed by synovitis, and when this subsided, the symptoms of a loose body in the joint were observed. On proceeding to remove this, Mr. Langton found it attached by a narrow pedicle,



which he divided. On examining the body, Mr. Bowlby found it to consist of recently effused blood clot, covered with a layer of synovial membrane.



Fig. 23.—An enlarged and indurated Fringe of Synovial Membrane, attached by a pedicle. (From the Museum of St. Bartholomew's Hospital.)

3. A synovial fringe, or a portion of synovial tissue, may become (whether from injury or some other cause) enlarged and indurated, and is then apt to be



Fig. 24.—Osteo-arthritis of the Shoulder Joint, in which the Synovial Membrane is studded with Tufts, many of which contain Nodules of Cartilage. (From a preparation in St. Bartholomew's Hospital Museum.)

caught and drawn out, by the movements of the joint, into a pedunculated body (Fig. 23). This may remain attached, or its stalk may give way, and it may

fall free into the articular cavity. Bodies of this origin consist of connective tissue and fat, often mingled with inflammatory products, and covered with synovial membrane. In some cases, all the symptoms of a loose body are produced by the presence of a small but indurated toughened synovial fringe, which, having lost its power of free gliding, is liable to be caught and pinched between the bones. Two years ago I removed such a fringe from the elbow joint of a man of thirty, and Mr. Smith one of like character from the knee joint of a young woman. (*See Internal derangement.*)

4. The fine villous processes of the synovial membrane contain, as Rainey and Kölliker have pointed out, a few cartilage cells embedded in their structure. In the course of subacute synovitis of long standing, due either to rheumatism or osteo-arthritis, or provoked by injury, these processes enlarge, and many of them are converted into nodules of fibro-cartilage (Fig. 24). These, becoming pedunculated, may be accidentally detached (Fig. 25).

5. Pieces of the articular cartilage, with or without a portion of the underlying bone, may, after injury, as pointed out by Teale, Sir James Paget, and others, exfoliate and drop loose into the joint without the symptoms of inflammation usually observed in cases that end in necrosis (Figs. 26 and 27).

6. Or a piece of cartilage, or of cartilage and some



Fig. 25.—Nodules of Fibro-cartilage, attached by an elongated Pedicle. (From a preparation in the Museum of St. Bartholomew's Hospital.)

of the adjacent bone, may be chipped off and fall into the joint.

7. Osteophytic growths around the articular



Fig. 26.—A portion of the Articular Cartilage of the Femur, which exfoliated, and was removed by operation from the knee joint. (From a preparation in the Museum of St. Bartholomew's Hospital.)

borders in osteo-arthritis may break off into the joint cavity (Fig. 28).

8. Mr. Shaw \* has published a case in which a loose body was found on removal to contain the point

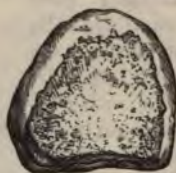


Fig. 27.—A portion of the Articular Surface of one of the Condyles of the Femur. It consists of articular cartilage and a layer of sub-adjacent bone. Removed as a loose body from the knee joint. (From a preparation in the Museum of St. Bartholomew's Hospital.)

of a broken needle. Probably the needle, accidentally embedded in the subsynovial tissue, had, by causing irritation, led to the formation of the body which had subsequently become detached.

The number of these bodies in joints is subject to great variety, and depends on their mode of origin.

\* Path. Trans., vol. vi. p. 328.

They are frequently single; but when they are formed in joints affected with osteo-arthritis, there



Fig. 28.—Masses of New Bone detached from the Articular Margin of the Hip Joint in a case of Osteo-arthritis. The joint, when opened in the dissecting room by Abernethy, contained fourteen loose bodies of this kind. (From the Museum of St. Bartholomew's Hospital.)

may be as many as from six to twenty or more. Abernethy found fourteen in the hip of an old woman in the dissecting room (Fig. 28).

Lately Mr. T. Smith removed 415 bodies from a



Fig. 29.—Specimens of the Loose Bodies found in the Knee Joint in Mr. Smith's case. (From the Museum of St. Bartholomew's Hospital.)

knee joint; all were of about the size of large peas, and composed of hyaline cartilage; only five or six



were attached; the remainder were entirely free in the synovial cavity (Fig. 29).

*Symptoms.*—It will be seen, from what has been said above, that under the name of loose bodies in joints several forms are included which differ from each other alike as to their origin, the condition of the joint in which they are placed, and the degree in which they are movable in the articular cavity. Hence we shall be prepared to find that the different kinds present considerable differences in the symptoms to which they give rise. As this is actually the case, it will be best in the first place to describe a simple and characteristic example, and then to allude to instances in which the diagnosis may be attended with difficulty. In a case in which a cartilaginous nodule derived from an hypertrophied fringe has become detached, and is free in the cavity of an otherwise healthy joint, or in which a piece of the articular cartilage has been shed, as in Fig. 27, the first symptom of its presence generally is that the patient, while in the act of walking, is seized with such agonising pain in the joint, coming on as suddenly as if it were due to a blow, that, losing all power in the limb, he falls to the ground, overcome with a momentary sensation of faintness. Sometimes the joint remains freely movable, and the patient is able to walk, when, after a few minutes, the pain has subsided. In other instances he finds that the joint is fixed in a position of more or less flexion, often combined with rotation of the tibia outwards, while any attempt to move it is attended with unbearable suffering. This fixed condition may remain for some hours, and then on some slight movement suddenly disappear; or it may continue till the limb is subjected to surgical manipulation. The accident is followed by a sharp attack of synovitis, lasting three or four days. On examining his joint when the acute attack has gone off,

the patient detects the loose body, and learns that it shifts its position, so that he finds it now in one situation, now in another, while at other times he is unable to discover its locality. On account of the manner in which these bodies change their site, and slip out of reach, the Germans have suggestively called them "joint-mice" (*gelenk-mause*). The most common spot at which they project is in the pouch over the external condyle, but they are often also felt on the inner side of the joint. The severity and sudden character of the pain are due to the fact that when, during movement of the joint, the loose body has slipped between the articular ends of the bones, while the enormous leverage dependent on the length of the tibia constitutes a force by which the ligaments are subject to sudden and violent stretching, and the articular surface, over an area corresponding to the size of the loose body, tends to be crushed in. The fixed condition of the joint depends on the fact that the loose body remains jammed between the articular ends of the bone, as a stone might be fixed in the hinge of a closing gate. More commonly, however, it is caught only for a moment, and, slipping away, leaves the movements of the joint unimpeded. The frequency with which the symptoms recur varies in different cases. In some instances the patient feels no inconvenience for three or four weeks, or for several months at a time. Especially is this the case when the loose body is of such a size or shape that it is only in certain movements of the joint that it can be caught. In others, however, the attacks are of daily, or even of hourly, occurrence. The symptoms are usually more severe at first than at a later period, when the joint appears to become more tolerant; but, in some cases, the frequent repetition of the injury leads to chronic effusion into the synovial cavity.

In cases of osteo-arthritis, in which osteophytes

become detached (page 182), as the movements of the joint are usually considerably interfered with by other changes, the symptoms are less typical. The patient, however, experiences a sharp and often excessively painful catch or sudden locking of the joint (which becomes fixed against movement in certain directions), and a body that changes its place may be discovered. When several are present, movement of the joint is very painful and restricted, and attended with a peculiar cracking or grating sensation. The patient also complains of a feeling of insecurity in the joint, which often gives way, so that he is in danger of falling.

In some instances, though the symptoms of loose cartilage are well marked, the patient may never have discovered the presence of the body. In such cases all the parts of the joint that are within reach should be very carefully examined. Probably in some instances in which the symptoms are ascribed to slipping of one of the semilunar cartilages (*see* page 208) a loose body is present in some part of the joint at which it cannot be detected. Thus in the College of Surgeons one is attached by a pedicle to the anterior crucial ligament in a position in which it could not be felt on external examination, but in which it might easily have impeded the action of the joint by becoming nipped between the ligament and the neighbouring condyle of the femur. A gentleman complained that his knee often "caught" and gave him sharp pain; and he could not completely extend it. After a violent wrench of the limb these symptoms entirely disappeared, and a loose body, which however caused him no inconvenience, was found slipping freely about in different parts of the joint. No doubt the "catch" experienced was caused by this body, which had been at first attached, but was separated by the wrench. The symptoms are equally obscure when the body is merely an elongated *fringe*. Whenever this is pinched there come pain, loss



of movement, and subsequently some synovitis, yet no direct evidence as to the origin of these symptoms will be apparent. But such a condition may be suspected if, between the attacks, the joint is found to be normal in appearance, and if it will sometimes move freely, while at others, on some trivial movement, it suddenly "catches." The patient often knows which movements produce the symptoms, and also how, when it has become fixed, he can disengage the joint.

*Treatment.*—In considering treatment it is necessary to remember the revolution which has taken place within the last few years in the management of recent wounds. The mortality attending many operations has fallen, in the last thirty or forty years, from sixty or seventy per cent. down to about four or five per cent. ; and the statistics of fifty years ago have no bearing whatever on the practice of the present day. We are free to disregard the results met with by Larey and the surgeons of his time, and to judge entirely by recent experience.

There are doubtless a certain number of cases in which no operative interference is advisable, *e.g.* in those in which either the loose body causes but slight inconvenience, or is easily kept from passing between the ends of the bones by the application of a knee cap or a pad and bandage to the joint. The form of apparatus for accomplishing this varies with the case ; but that which is most often useful consists of a laced knee cap with a pad arranged to take effect at some point which experience has taught the patient, or the surgeon, that pressure will fix the loose body. In some instances one or other of the knee clamps shown at pages 212, 213 will succeed. In other cases, especially of osteo-arthritis, the joint may have become so irremediably stiff and crippled that little would be gained by removing any loose body that was detected. In other cases, again, the whole synovial membrane is so



loaded with cartilaginous growths that the case is fairly beyond the reach of operative treatment.

In the great majority of instances, however, operative interference is called for, and may be very safely adopted. Moreover, most of the cases of loose cartilage occur in persons between the ages of twenty and fifty, whose joints are otherwise healthy, or at least not extensively diseased, and in whom, if performed with care, an operation entails very slight risk.

Whatever the operation that is selected, it must be performed with every attainable guarantee against subsequent disturbance of the joint, and against the admission of septic material by the wound. We have the choice of two methods: the direct and the indirect. By the first an incision is made directly into the joint, and the loose body is there and then removed. By the second a valvular opening is made into the joint, and the cartilage is slipped out into the subsynovial fat, and allowed to remain there till the wound of the joint is healed. If it gives no trouble it may be left where it is, or it may be extracted on some later occasion.

The direct method is thus performed. The loose body must be found, and held in the spot at which it is proposed to remove it, and the limb should be placed on a splint before the anæsthetic is administered; and it may save disappointment if the trick of fixing the body has been practised beforehand by the assistant to whom this office is to be entrusted. When the patient is insensible, one or two strong needles in handles should be used to transfix and steady the cartilage, and this should then be exposed by a careful dissection, and removed, any bleeding having been stopped before the joint is opened. The wound is then closed by carbolic sutures, covered with a piece of protective, and dressed with carbolic gauze.

The following is the indirect method: a knife,

resembling a large-sized tenotomy scalpel, mounted on a long shank, is introduced at a distance of an inch and a half from the cartilage, and is passed on till its point is in contact with it. It is then moved horizontally in contact with the surface of the cartilage, so that the synovial membrane is opened widely enough to allow the cartilage to pass out. When the surgeon believes that he has effected this, he partially withdraws the knife, and moves its blade in the subcutaneous tissue from side to side, so as to form a large space or pocket, into which the cartilage may be slipped. Here it is left, either permanently, or for removal at a later period, as already described. As to the choice between these two operations. There can be no doubt that whereas the direct method is, if care be taken to fix the cartilage, a proceeding of no difficulty, the indirect method is not only often difficult, but uncertain. Surgeons have often failed to complete it, and have been obliged to discard it, and have renewed the attempt, sometimes with no better success, at a future period. The great difficulty is to press the cartilage from the synovial cavity into the subsynovial fat. This difficulty arises because either the synovial membrane has been imperfectly divided, or a sufficiently large and clean-cut pocket has not been prepared in the surrounding fat. But even when these points are borne in mind, it often remains very difficult to carry out the operation, and much more injury is inflicted in persistent attempts to complete this proceeding than is involved in the shorter and more manageable direct method. Hence I think that the direct method should have the preference.

In those cases in which the body is attached, as in Fig. 24, to the synovial membrane, or in which it consists of a tough fringe, such as is shown in Fig. 23, the direct method must necessarily be selected. When the synovial membrane is studded with many large

cartilaginous nodules, so that the movement of the joint is seriously impeded, those masses which are thought to be the source of most trouble may be excised, while others are left for subsequent removal should this prove necessary. In the after-treatment nothing is required but to keep the limb at complete rest on a splint, until, and for three or four days after, the external wound is completely healed.

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## CHAPTER XVI.

### INTERNAL DERANGEMENT OF THE KNEE AND OTHER JOINTS.

IN a paper which has since become classical, Hey,\* as long ago as in the year 1803, described five examples, selected from many he had observed, of what he called internal derangement of the knee joint. The name was a good one, for without involving any theory as to the manner in which the condition was produced, it served as a clear heading for the group of cases he had to relate. From a clinical point of view, also, the phrase was very appropriate. It exactly conveyed what can be seen, and what the patients themselves describe in many of these cases, namely, that something has occurred in the joint which has reduced it to a condition which may be compared to that of a hampered lock, or as some have said to a gate with a stone in its hinge. Such a joint will move freely in one direction; but in the other, when it has reached a particular point, its motion is suddenly arrested. Very generally the defect is that the limb cannot be completely straightened. The patient can usually walk on the limb, but he does so with an obvious limp.

\* "*Practical Observations in Surgery*," by W. Hey.



The idea of internal derangement also well accords with the suddenness with which, on some trivial movement, or slight twist of the limb, the accident may be produced, and equally well with the manner in which, during some trick of handling the joint, or in some casual or unconscious movement, something is felt to slip, or a snap is heard, and the impediment is found to have suddenly and completely disappeared. One patient told me his knee was very apt to slip if, forgetting himself for the moment, he crossed his leg over the other while he was sitting; another, that his knee would always slip if he sat on his heels with his limbs abducted; a third that his knee went out if, when the limb was nearly extended, his toe was suddenly turned outwards; and all these patients knew exactly by what equally slight counter-movement the lock could be removed.

Hey's account is so concise, and his cases are so well selected, that with the double purpose of paying a tribute to the memory of one of the ablest and most sagacious of English surgeons, and of adding very largely to the value of the present work, I have drawn up a short abstract of his paper.

Hey remarks, "though so firmly supported by tendons and ligaments, the knee joint is not unfrequently affected with some internal derangement of its component parts, and that sometimes in consequence of trifling accidents. In cases unattended with contusion, the joint, in respect to its shape, appears uninjured; at most the ligamentum patellæ appears rather more relaxed than in the sound limb. The leg is readily bent or extended by the hands of the surgeon, and without pain to the patient. At most, the signs of uneasiness caused by this flexion and extension are slight. But the patient himself cannot freely bend or extend the limb in walking; he is compelled to walk with an invariable and small degree of



flexion. Though the patient is obliged to keep the leg thus stiff in walking, yet in sitting down the affected joint will move like the other." The complaint, Hey believed, is brought on by some alteration which "prevents the condyles of the femur from moving freely in the hollow formed by the semilunar cartilages, and articular depressions of the tibia. An unequal tension of the lateral or cross ligaments of the joint, or some slight derangement of the semilunar cartilage, may probably be sufficient to bring on the complaint."

*Case 1.*—Hey's first case has already passed its centenary, for it occurred in 1782. A gentleman, while turning himself in bed, felt a sudden pain at the insertion of the biceps into the head of the fibula, and that tendon seemed rather on the stretch. In other respects the joint seemed perfectly natural. When Hey examined the knee he could bend and extend the limb as freely as the sound one. There was no swelling in any part of it. There was no protrusion of the semilunar cartilage. The patient had twice before had similar lameness, which on both occasions had left him instantaneously. After walking a few steps, and while he was talking to Hey, the patient suddenly cried out, "I am quite well," and immediately was able to walk without the least degree of lameness.

*Case 2.*—In 1784 a young lady, while resting on one leg, and stretching forward to lift a child, strained her knee, as she supposed, and became immediately lame. Five or six days later, Hey, on comparing the two knees, could find no difference, except that when the limbs were placed in a state of complete extension, the ligament of the patella of the injured joint seemed rather more relaxed than the corresponding ligament of the opposite side. Passive movement caused no pain; but the patient in walking could neither fully bend nor fully extend the knee; and she walked with *the limb bent*, and with pain and a considerable limp.

Placing the patient on a high seat which had nothing underneath it to prevent the leg from being fully flexed, Hey, after he had extended the limb, suddenly moved it into full flexion. After repeating this movement (extension followed by complete flexion) he found the patient could immediately walk without lameness. Three days later, she danced without inconvenience or receiving any injury from the exercise.

*Case 3.*—Two years subsequently the young lady produced the same injury in rising hastily out of bed. After the lameness had continued about a week, Hey was again consulted. His method of cure described above was made use of, with the same immediate success.

*Case 4.*—A schoolboy, while climbing into a chaise, had his leg caught in the wheel and severely twisted his knee. The joint swelled and became very painful, but after a week's rest in bed he was able to move about. From this time he could run, but it was in a very awkward and imperfect manner, for he could not put his foot flat upon the ground. He was obliged, in walking, to rest upon his toes whenever he raised the sound limb from the ground, and to keep the knee a little bent, being incapable of extending the limb in a progressive motion. "A person, observing the manner in which he performed this exercise, would have thought his knee to be stiff; yet there appeared to be no rigidity in the joint when it was moved by the hands of another person while he himself sat in a chair." Hey saw the boy a fortnight after the accident. He extended and then bent the limb to a considerable degree, repeating the operation twice or three times. The patient was enabled immediately to walk in a natural manner, and in a few days regained the perfect use of his limb.

*Case 5.*—A clergyman fell from his horse, and bruised his knee. A violent pain was brought on, which continued for an hour and a half, and the

joint became stiff and discoloured. In a week the swelling subsided. "At the end of a month his power of walking was not at all increased, yet the injured knee appeared like the other. I could bend and extend the limb without difficulty, and without giving him pain; but when he walked he could give the joint no motion by the natural effort of the muscles. He walked, to use his own expression, 'as if he had no joint in his knee.' I extended and bent the joint with rather more force than I had used in the preceding cases; yet upon a first trial he could not use the joint so well as I wished. I repeated the operation after an interval of a few minutes, and he immediately regained the power of walking as well as usual, except that he felt a little weakness for a few days."

Such is Hey's account of this accident, and all that has since been observed has confirmed the general accuracy of his sketch. In the century that has elapsed since his description was published, the subject has hardly attracted its due amount of notice, and no one, I think, has worked it out systematically. Yet it is a question which is worthy of careful investigation. The affection is much more common than some have supposed, and it is by no means rarely overlooked. Though met with most frequently, and in its most characteristic forms, in the knee, internal derangement is not confined to this articulation. It occurs in some of the other joints, the temporo-maxillary, the elbow, and probably in the shoulder and the hip. As to treatment, it must be considered not only how the displacement may be corrected, but how its subsequent return may be prevented.

In the following paragraphs I shall first relate, and remark upon, a selection from the examples which have come under my own observation, or which I have found recorded, and which include varieties of the



accident of which Hey was not aware, and then the general question of treatment will be discussed.

*Case 1.*—Sir William Fergusson\* found, in a subject brought to King's College for dissection, "that one of the semilunar cartilages had been torn from the tibia throughout its whole length with the exception of its extremities, so that during flexion and extension it occasionally slipped behind the articular surfaces. The cartilage was flattened in its outer margin, and when it passed behind the condyle of the femur, seemed to fit to the articular surfaces as accurately as the internal cavity does in the natural condition of the parts."

Fergusson does not state which cartilage was thus displaced, nor is there anything in his description to settle this point.

*Case 2.*—Dr. Reid† exhibited a specimen, taken from the body of a patient who died in the Edinburgh Infirmary. His history could not be traced; while in the Infirmary he had made no complaint of his knee, nor did the nurse remember to have observed any limp in his walk. The fibrous tissue connecting the outer margin of the external semilunar cartilage with the edge of the tibia was torn through in its anterior half, and the semilunar cartilage was found thrown inwards and backwards, and placed between the spine of the tibia, the posterior crucial ligament, and the posterior ligament of Winslow. The transverse ligament was entire. The cartilage itself was considerably flattened and broadened, and the remaining portion of the fibrous tissue, connecting its outer margin to the tibia, was much thickened, and had assumed somewhat of a fibro-cartilaginous appearance. The motions of the articulation seemed sufficiently free as far as could be judged in the dead body.

*Case 3.*—Mr. Godlee recently exhibited a specimen

\* "Prac. Surg.," p. 360. 4th ed. 1857.

† *Edinburgh Med. and Surg. Journal*, vol. xlii. (1834), p. 377.



at the Pathological Society \* found by Professor Thane in an old anatomical preparation at University College, in which the external semilunar cartilage was displaced. The circumference of the fibro-cartilage had been torn away from its attachment to the capsule of the joint, and had become displaced inwards, so that it lay in the gap between the two condyles of the femur. The displacement, Mr. Godlee remarks, must have occurred some time before death, for the fibro-cartilage remained stiffly in its abnormal situation, and appeared to have somewhat shrunk from its natural size; it was also obviously flattened by the pressure of the inner part of the condyle. A drawing accompanies Mr. Godlee's description of this specimen.

*Case 4.*—H. B., a former house surgeon at St. Bartholomew's Hospital, has kindly furnished me with the following notes of his own case. Nine years ago, when he was a student, he caught his foot in some long grass, as he was playing football, and screwed his femur suddenly and violently inwards on the head of the tibia. He found his knee flexed and locked; but it was righted when the leg was forcibly extended and rotated inwards by one of his comrades. It went out several times on the journey home, and the accident was followed by a severe attack of synovitis. For several months afterwards if he caught his toe in the carpet, or otherwise entangled it, the knee "went out," and it was sometimes half an hour before manipulation succeeded in putting it right.

*Case 5.*—A girl, aged fourteen, overbalancing herself as she was seated in a dogcart in rapid motion, had her leg caught in the wheel and her knee violently wrenched. The accident was followed by severe pain, and considerable ecchymosis and swelling of the joint. She was confined to bed for a fortnight, but then she was able to

\* *Path. Trans.*, vol. xxxi. p. 240.

walk, and, a few days later, appeared to have recovered. As soon, however, as she began to use the limb actively, she found that her knee frequently "slipped." Thus, when she was walking upstairs, or even, as was often the case, on level ground, the joint suddenly gave way under her, so that she nearly fell. She had extreme pain, and became unable to bear any weight on the limb. After the "slip" she could sometimes move the limb, but sometimes it was fixed till on some slight movement "something went in," and free motion was restored. The slipping occurred sometimes twice or three times in a week; sometimes not more than once in a fortnight or three weeks. After a "slip" the joint was hot, painful, and swollen for a time, and then it entirely regained its natural appearance. She had been recommended to keep the knee at rest, but latterly she had disregarded this advice, for she found the joint was as likely to slip when she turned in bed, or on any casual movement of the limb, or as she was sitting in a chair, as it was during active exercise. She would sometimes dance all the evening and feel nothing of her knee, either at the time or afterwards, yet it often went out if she moved her limb as she lay on a sofa, or if she crossed the knee over the opposite limb. When I examined the joint, there was nothing abnormal to be observed in it; the patient could freely bend and extend the limb; it was perfectly cool, and free from swelling. She could both walk and run without any trace of lameness. So lately, however, as four days previously, the knee had slipped, and she had been confined to the sofa till pain and heat had subsided. She pointed to the inner side of the joint, in the interval between the femur and the tibia, as the spot at which she felt pain when the slip occurred, but she had never felt any protrusion or any depression in this or any other part of the joint.

*Case 6.\**—A patient, æt. twenty-three, stated that, "while standing, on August 13th, 1858, with the whole weight of his body resting upon the left leg, a man struck him on the lower part of the inner side of the left femur. The blow was made with the palm of the hand, but with sufficient force to throw him down. It was immediately observed that the tibia was partially dislocated inwards at the knee joint. A person present in the room seized upon the foot, and by extension brought it back to its place: the bone resuming its position with an audible snap. After this he continued to walk about till night. Two days after, the knee had become so much inflamed that he was obliged to take to his bed, to which he was confined three weeks. Gradually the swelling subsided, and in about five weeks after the accident, he began to walk on crutches. On Sept. 23 he was walking without crutches, when he suddenly fell to the floor, as if he had been tripped up." When Hamilton saw him, on Oct. 27th, this occurrence had happened many times, but had never been attended with pain. The joint was distended with synovia, and tender; and Hamilton could distinctly feel a hard body just to the inner side of the ligamentum patellæ, which moved freely under the finger.

In the first three of these cases, though they are without a history of the accident by which the injury was inflicted, it is evident that one of the cartilages (in cases 2 and 3 it was the external) had been torn away from its marginal attachments, and had become free to slip, in the one case backwards, behind the condyle; in the others inwards, so that it lay in the intercondyloid notch. In cases 4 and 5 the lesion was also of the same kind, for in both the joint was very forcibly wrenched; and in case 4, though the knee was at once put in, it slipped several times during the journey home;

\* F. Hamilton: "Fractures and Dislocations," p. 754. 5th ed. 1875.



while in case 5 the same occurred as soon as the patient, having recovered from a severe attack of synovitis, began to use the limb. Again, in case 6, after a blow on the inner side of the thigh violent enough to produce partial dislocation of the leg inwards, it was found, when synovitis had passed off, that the "internal derangement" frequently recurred. Moreover, Hamilton could distinctly feel a hard body freely movable near the inner border of the patella, so that we may believe that the attachments of the disc had been torn.

*Case 7.*—Mr. Brodhurst gives the following case : \* A clergyman, aged 25, kicked at a football, and, missing it, swung round, and fell to the ground. On rising he found he could not walk. Six weeks later, and when the swelling of the left knee which followed the accident had subsided, he was still unable to walk except with two sticks. On examination the joint presented a loose cartilage on its inner side, immediately in front of the internal lateral ligament. During the operation for its removal the body was found to be held *in situ* by a small band of ligament. The body proved to be three-quarters of an inch in length, and to consist of the anterior portion of the internal semilunar cartilage, retaining in every respect its normal appearance. This is the only case I know of in which laceration of one of the cartilages has occurred ; yet the accident is probably not a very rare one.

*Case 8.*—In a subject lately in the dissecting room of St. Bartholomew's Hospital a considerable piece had become partially detached from the rim of the internal cartilage, and was found standing up like a tongue, so that it would have had the effect, when it was nipped between the bones (as it was in certain positions of the joint), of locking the knee. A deep groove on the cartilaginous edge of the femur had been formed, by long pressure, for its accommodation.

\* St. George's Hospital Reports, vol. ii. p. 142.



*Case 9.*—Mr. Todd White relates\* the case of a man, aged thirty-three, who, after kneeling for some time on the floor, in a posture as “if sitting on his heels,” was seized while in the act of rising with sudden and severe pain in his right knee, and found that he



Fig. 30.—Displacement of the Internal Semilunar Cartilage of the Knee Joint, with the formation of a deep sulcus in the skin, indicated by dark shading.

was unable to straighten his limb. Three days Mr. White saw him. The knee could be considerably bent, and there was no swelling; but any attempt to straighten it caused great pain. There was great tenderness over the inner tuberosity of the tibia, none over the outer. When the patient was under chloroform the limb was bent and then forcibly extended, at first without result; but when this was repeated (the thumb being firmly pressed over the tender point) a slip was felt, and

the limb was found to be again freely movable.

*Case 10.*—There is in the Museum of St. Bartholomew's Hospital a cast (Fig. 30) representing a knee in which displacement of the internal semilunar cartilage had been produced by external violence. Over the situation of the cartilage there is a deep depression in the integument. The man had been knocked down, and had fallen with his knee bent under him, and from that instant was unable to bear any weight on the limb. In examining the limb, whilst the knee was bent to its utmost, a sudden crack was heard; the depression on

\* *Lancet*, vol. i. p. 11. 1856.

the inner side of the joint disappeared, and the mobility of the joint was restored.

*Case 11.*—W. C., aged 33 (a patient of Dr. Chalmers'), slipped off a plank a few inches from the ground and wrenched his knee. He immediately found that the joint was locked in a partially flexed position, and that any attempt to straighten it gave him severe pain. Dr. Chalmers took him to Mr. C. Heath, who set the joint right by manipulation. Two years later, when he was superintending the building of a house, and as he was stepping across some rafters, his foot slipped, and the knee again became locked in a bent position. I saw him, with Dr. Chalmers, Mr. Heath being out of town, two days later. The knee was flexed at an angle of about  $110^{\circ}$ , and any attempt to walk upon the limb caused the patient severe pain. He had no power of moving the joint. When he had taken ether I completely flexed the limb, and rotated the tibia on the femur; but, on bringing it down, I found the joint was still locked against full extension. On repeating, however, the movements of full flexion and rotation a sharp snap was heard, and the limb was then found to be freely movable. On recovering from the ether the patient could move the limb in a perfectly natural manner. A year later Dr. Chalmers told me there had been no return of the displacement. I am unable to say which cartilage had slipped in this case.

*Case 12.*—I have notes of a case in which a young lady at a dancing lesson was reprimanded for not turning her toes out sufficiently, and was made to stand at the end of the room with her heels together and her feet strongly everted. Being ordered by the master to turn the toes out still further, in making the effort to do so, she felt something give way, and suddenly fell to the ground, having dislocated her internal semilunar cartilage.

*Case 13.* — In 1876 C. G., then 17, in falling from his bicycle, caught his left leg in the wheel, and violently wrenched his knee. After lying in bed for ten days, with sharp synovitis, he was able to limp about; but the joint was painful; and though he could bend it freely, he was unable to straighten it. At the end of five weeks, as the joint remained locked and painful, he went to a bone setter, who, after bending the leg fully on the thigh, suddenly jerked it straight. After two or three trials the knee went in with a snap, and he walked home with free motion in the joint. The manipulations used to effect reduction were attended with severe pain, but this subsided in the course of three or four minutes. He felt no more of the knee till six months afterwards, when, as he was jumping over a hedge in pursuit of a rabbit, the joint slipped again. An attack of acute inflammation ensued, lasting several days. From this date the knee frequently slipped, and on four or five occasions he was obliged to send for a surgeon to put it in for him. Once it slipped while he was bathing, and he was compelled to wait in the bathing machine for three-quarters of an hour till a surgeon could be procured. The displacement was on this occasion easily reduced by pressing on the inner aspect of the joint, and at the same time slightly flexing the leg. Having seen how readily reduction was thus effected, the patient found he could perform the operation himself; and he subsequently always did so. In the summer and autumn of 1877, while he was on a sea voyage, the joint frequently slipped (as often as twice in a day) on any slight movement, as on turning in bed or rising from a chair. He now came under my observation. The knee presented a normal appearance. He pointed to the situation of the posterior half of the cutaneous margin of the internal semilunar cartilage, on the inner *side* of the joint, as the spot at which the slip occurred,



and where he placed his thumb to effect reduction. I could, however, feel nothing, and he said he had never detected either any projection or any depression there.

In this group of cases, though some laceration had probably taken place, the symptoms were due to the fact that one of the cartilages had, during a strong wrench of the joint, become displaced from its normal relation to the condyle of the femur; or, to put it otherwise, that the condyle had "overshot" the cartilage and slipped over its rim. The recurrence of the accident on subsequent occasions, which occurred in C. G.'s case, no doubt depended on the relaxation of the attachments of the cartilage which followed repeated attacks of synovitis.

In another set of cases the attachments of the cartilages have become elongated (as the result sometimes of simple chronic inflammation, and sometimes of rheumatic synovitis, or the changes associated with osteo-arthritis) and have slipped out of place. I have met with several instances of the first kind. They are common in football players and other athletes, as the result of repeated traumatic synovitis, while examples of the second class are frequently seen in the out-patient department of the hospital.

One of the cartilages may not only be relaxed in its attachments, but may slowly undergo inflammatory enlargement, so that it becomes a source of mechanical difficulty.

*Case 14.*—Emma T. is now twenty-seven. When she was fourteen she fell down some steps, and severely bruised her right knee. After lying on the sofa, however, for two or three days she lost all pain, swelling disappeared, and she thought no more of the accident. Two years later, when, as an apprentice to a draper, she had to stand many hours in the day, she found the knee become painful and swollen. Going for advice to the London Hospital, she was recommended



a bandage and some liniment, and ordered to rest the joint. Two years later, the joint, having in the interval continued weak, painful, and often swollen, began to slip and become locked. At first the slip was only to a slight extent, and the knee righted itself spontaneously, and at the moment. But the lock soon became more complete, and she grew into the habit of asking her friends to help her to correct it, and get the joint in. This she found could always be done by "raising the heel and shaking the knee." She presented herself in the out-patient room at St. Bartholomew's Hospital two years ago. The joint was freely movable and quite cool, and nothing abnormal could be observed except on the outer side in the interval between the femur and the head of the tibia. Here, lying horizontally between the two bones, was a swelling about three-quarters of an inch in length from before backwards, and about half an inch from above downwards, which seemed evidently caused by enlargement of the semilunar cartilage and thickening of the synovial membrane. When the knee was fully extended this swelling protruded nearly to the size of the ring finger; when the knee was flexed it receded, and was lost sight of, leaving the outline of the joint quite natural. The slip occurred at this period once or twice in every week.

I regarded the case as one in which the external semilunar cartilage had undergone gradual enlargement in consequence of injury aggravated by over-long standing. The slipping was probably due to the gradual increase of the size of the cartilage, and the stretching of its attachments, which resulted from the manner in which the bones, as they moved one upon the other, forced it out from between their opposed surfaces; while the lock occurred whenever the cartilage, instead of gliding out, was caught between the bones. This case was, I think, similar to one recorded by

Malgaigne, and quoted in Holmes's "System of Surgery:"\* The patient was a female who had previously been the subject of severe inflammation of the joint, which ended in enlargement of the external semilunar cartilage. One day, on attempting to put the limb to the ground she fell down, and Bassius, who was called in, found the cartilage greatly enlarged and projecting outwards. It was reduced by pressure, but required a plaster and bandage to retain it in its place. The clamp (Fig. 32), described below, was applied. From this time, though the joint occasionally gave way to a slight extent, it never slipped as it had previously done, and no manipulation was ever required to set it right. At the present date (March, 1886) she is still, at the end of six years, wearing the clamp. The joint looks natural except at the outer part, where, as before, when the limb is extended, there is a swelling in the situation of the external semilunar cartilage about as large as a small walnut, embedded in thickened and indurated synovial membrane. On flexing the joint the swelling disappears. The patient says she has a good deal of pain in the joint, and considerable swelling occurs when she is long on the limb, or after a long walk.

A curious condition of the knee is sometimes met with, apparently depending on very wide slipping of one of the cartilages in its relation to the corresponding femoral condyle.

*Case 15.*—A labourer, twenty-one, was under Mr. Lucas at Guy's Hospital in 1879. He stated that two years before, in an attempt to get out of a hole in the ground, he had thrown the whole of his weight on the inner side of his right leg and foot, and had thus injured his knee. He was weak in the joint for some weeks afterwards, but felt no permanent ill effects. Three weeks before applying at the hospital he twisted his

\* Vol. ii. p. 917.

knee in descending a ladder. The joint, he said, became suddenly locked, so that he lost power in the limb. He complained of little pain; but on flexing and extending his joint a curious phenomenon occurred. When the knee was about half flexed, the leg and foot jerked inwards with a sudden shock, and, at the same time a projection occurred on the outer side of the patella, which could be seen and felt. On extension the leg and foot jerked suddenly outwards, and the semilunar cartilage went back into its place. The joint was enclosed for four months in plaster of Paris, and subsequently treated by passive movement. At the end of six months after he was first seen the patient was discharged, the movements of the joint being free and smooth, and there being no longer any tendency to displacement. Mr. Lucas believed that "when during flexion the leg and foot received a sudden twist, and a shock was communicated to the hand, the convex part of the external condyle of the femur had slipped behind the posterior rim of the semilunar cartilage; and that when during extension the leg became straight with a similar, though less evident, jerk, the condyle had slipped back over the cartilage, and the parts had resumed their normal position."\*

*Case 16.*—Many years ago, a girl, aged nine, was under my care at the Hospital for Sick Children for her knees. In the left knee exactly the same phenomenon as that described by Mr. Lucas was observed when the limb was flexed and extended, and with the jerk of the leg was accompanied by a dull snap. The right knee occasionally jerked during flexion and extension in the same manner as the left. The condition had been noticed very soon after the child's birth. Both joints were very loose, and the head of the tibia could be moved from side to side on the condyles of the femur when the limb was flexed. I kept the left joint fixed

\* *British Medical Journal*, Nov. 15, 1879.



on a splint in the extended position for four months, but without benefit. I then lost sight of the case.

I have seen two other apparently precisely similar cases. One in an infant only a few months old (shown to me by Mr. Thomas Smith), in which the condition seemed to be due to some congenital abnormality; and one in a boy of twelve. In this instance the knee clamp (Fig. 32) was applied, and a few weeks later the boy was admitted with an acute attack of synovitis, partly due to his having drawn the strap above the patella too tightly, and having walked about with the knee thus constricted. When the synovitis had passed off, I found that the knee no longer jerked on movement. No doubt the cartilage had become (at least for the time) fixed in its normal position by adhesions.

The joint that is by far the most liable to internal derangement is the knee. I have, however, seen it in the elbow, and I have heard of the case of a lawyer, whose jaw, at some critical moment (as, for instance, in the middle of a speech to the jury, when he allowed himself to indulge in a flight of eloquence, involving a too rapid and energetic action of the muscles of articulation), would suddenly slip and become locked, so as to fix his mouth in a half-open and unsymmetrical position. Overtaken by this accident, casting an appealing glance at "my lud" and the gentlemen of the jury, and looking unutterable things at his learned friend opposite, who loaded him with amiable condolences, he would bury his face in the folds of a large handkerchief, with which he was always provided, and rush into the privacy of an adjoining room, whence, having, by a trick he had acquired, got his jaw in again, he would soon return and continue his address.

In the knee the internal cartilage is involved more often than the external; but the latter is, beyond doubt, often affected.



The accident is most common in persons between twenty and fifty, but it may occur (in osteo-arthritis, etc.) in people above this age. It is sometimes met with in children. Two or three years ago, a little girl, aged nine, was under my care at St. Bartholomew's Hospital for lameness of four months' duration, resulting from displaced internal cartilage.

*Diagnosis.*—This condition of internal derangement of a joint is apt to be overlooked. (See page 209.) Yet its recognition is usually, when care is taken, not a matter of any real difficulty. The symptoms bear a general resemblance to those of "loose cartilage," but they differ widely in the various groups of cases noticed above. The most clearly marked instances are those (cases 10, 11, 12, 13) in which a person on wrenching or twisting his knee is attacked with sudden and intense pain, and finds his joint is "out," or locked, so that he is unable to straighten it. On examination, nothing to account for this condition can generally be either seen or felt; but sometimes either a depression or a protrusion is detected in the situation of one of the semilunar cartilages. During some casual movement (or during manipulation) a snap is heard, and the joint is free again. The accident is usually followed by a sharp attack of synovitis, lasting three or four days. When one of the cartilages is torn from its connections, or torn across, the symptoms noticed in cases 4 and 7 will characterise the injury.

In the less marked examples (in which the cartilage, owing to relaxation of its attachments, has a too free range of movement, or in which an enlarged and toughened synovial fringe becomes caught, page 181) the patient states that although his knee between the attacks is perfectly free, he often finds that it suddenly locks or "catches;" that he feels pain, which is, in some cases, though this is rare, so severe as to induce *faintness*, or to drop him to the ground, in others only

slight; that the lock is only momentary, or that it remains till the knee is manipulated; that the "slip" is followed by two or three days' pain, swelling, and heat of the joint. In these instances there is usually no visible displacement. In cases of rheumatic disease, or of osteo-arthritis, diagnosis will turn on the account the patient gives of the sudden "lock," attended with the symptoms I have mentioned.

The cases most apt to be overlooked are those in which the injury that leads to displacement of one of the cartilages is severe enough to induce also acute synovitis; or in which the displacement itself leads to the latter complication. In such instances, unless the possibility of displacement is borne in mind, the case is regarded as one merely of synovitis, and the stiffness remaining after the inflammatory attack has subsided is attributed to this cause. Oversights of this kind are much to be regretted. They prolong the time, it may be for several months, during which a person, to whom it is of the first importance to regain the use of his limb (a labouring man, for instance) is allowed to remain crippled; and it drives patients to bone setters, with the result that the movement adopted, however rough it may be, is very likely to produce a cure, to the no small discredit of surgery. A gentleman some time since remarked that he wished surgeons would be more careful in their management of their cases. When I asked him to reduce this sweeping lament to the particular instance he had in view, he said that his gamekeeper had been for a month in a hospital for lameness, and had been discharged no better; and that on leaving the hospital he had gone straight to a bone setter, who told him his knee was out, and there and then "put it in." When, my censor continued, the man expressed surprise that the doctors did not find that his knee was out, the bone setter replied, "Oh,

doctors understand the big bones, but they know nothing about the little ones," a remark which seemed to the patient, and also, I found, to his master, a full explanation of what had occurred. From what I subsequently heard there seemed no doubt the case had been one of internal derangement, followed by synovitis, in which the latter complication had led to an oversight of the displacement, which remained to cause lameness after the synovitis had subsided. There was a clear history that the joint had slipped on a previous occasion.

*Treatment.*—This consists of two parts. First, the reduction of the displacement, when the "lock" persists; secondly, the prevention of a repetition of the accident.

1. As already said, in many cases the displacement is only momentary, while in some the patient either knows how to effect reduction himself, or is able to instruct a passer-by how to do it for him. A gentleman told me that sometimes in his country walks his leg "went out," and he had to sit by the roadside till some one came past, and, carrying out his directions, put the joint in for him. The manipulation most often successful consists in bending the knee to the fullest extent: drawing upon the tibia as if to separate the articular surfaces: rotating the tibia on the condyles of the femur inwards and outwards, and then extending the leg upon the thigh quickly, but not with any undue violence. At the same time pressure with the thumb should be made on any part of either semilunar cartilage which seems to be abnormally prominent. Reduction may sometimes be effected without the use of an anæsthetic. In many cases, however, an anæsthetic is necessary; while it is often highly advisable, not only in order to relieve pain, but also to abolish muscular resistance, and so limit the amount of force that is used. The movements



described often succeed on the first trial, but they may have to be repeated once or twice; or they may have to be varied, extension being made while the foot is strongly everted or inverted, or while the tibia is abducted or adducted. Instances have been recorded in which reduction could not be effected though repeated attempts were made. This is easily understood when such cases as 1, 2, and 3, related at page 195, are borne in mind. Still, with the help of an anæsthetic the displacement can very generally be corrected. Should the first trial fail it should be repeated in a few days, when the joint has become cool. Many instances of reduction, some by a fall or other accident, which have taken place after a considerable time, have been recorded. Often when reduction takes place a distinct "snap" is felt or heard. But often, again, this is not noticed, and the displacement is known to have been effected only by the disappearance of all resistance to full extension of the leg.

2. In some cases, in which, in a sound joint, one of the cartilages becomes displaced as the result of a strong wrench, or of torsion of the leg upon the thigh, but without laceration of the cartilage or of its attachments, the knee, either spontaneously or under manipulation, may go in with a snap, and the displacement may never recur. Very frequently, however, either as the result of more or less laceration, or relaxation of its connections, the cartilage slips from time to time, sometimes several times a day, sometimes only once in three or four months. Under these circumstances some mechanical appliance is called for. Rest and lotions are obviously useless. Fortunately two clamps have been invented, one or other of which will very generally succeed in preventing the "slip." Neither interferes with movement. The first (Fig. 31) consists of a steel band passing



from side to side across the back of the joint, and ending laterally in two plates, which clasp the joint and skirt the edges of the patella, a pad being placed beneath the plate, should either of the semilunar cartilages be felt to project. In a large number of the slighter cases this clamp answers admirably. Should it fail, the appliance shown in Fig. 32 may be used. Indeed, of the two, the latter is more to be relied

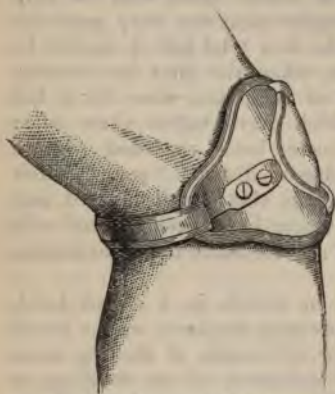


Fig. 31.—Clamp for cases of Displacement of the Semilunar Cartilages.

on, though it is open to the objection that it is more bulky and conspicuous. This, however, constitutes no objection in female patients, and in male patients it scarcely shows if the trouser is cut a little full at the knee. I have used this clamp (No 2) in a number of instances, and in a large proportion of them it entirely prevents displacement. Many persons have been able to dance and

play tennis or cricket in it without inconvenience, and without any renewal of the slip. These clamps are made by Mr. Spratt, of New Bond Street. I have been led to regard them as among the most valuable appliances with which I am acquainted.

The period during which they must be worn will obviously vary with the case. When displacement has followed partial laceration of the connections of the cartilage, if a renewal of the slip is prevented for *six months*, the torn structures may heal and at the

end of this time the support may be left off. The same may be the case when the attachments of the cartilage have become relaxed during synovitis which has passed off. In instances, on the other hand, in which laceration has been extensive, or in which the joint is the seat of chronic change, the clamp may have to be worn permanently, or at least for an extended period.



Fig. 32.—Clamp for cases of Displaced Cartilage.

I have known several patients recover after using the clamp for eighteen months or two years.

Some important cases bearing on the treatment of abnormal conditions of the semilunar cartilages by removal are recorded by Professor Kocher, of Berne.\* This author gives three instances of what he terms *meniscitis fungosa*, or fungous disease of the internal meniscus. In one of these cases, occurring in a man of sixty-five, the disease had lasted nearly nine months, and had obstinately resisted treatment. Effusion into

\* *Centralb. für Chir.*, No. 44, 45, 1881; and *London Medical Record*, Jan., 1882.

the knee joint was present. The patient was cured by the application of the actual cautery over the swollen and tender meniscus. In the two other patients, one aged twenty-one and the other six, the disease had gone on to suppuration and the formation of sinuses. In each case the diseased semilunar cartilage was excised, and the patients recovered with free movement of the knee joint. The recognition of this affection is difficult. In Professor Kocher's cases the most marked swelling and tenderness were not limited to the site of the diseased cartilage, and before the operation the internal condyle of the femur, in one case, and the head of the tibia in another case, were thought to be the main seats of disease. In a fourth case, of thickening of the external semilunar cartilage, in a lad of fifteen, accompanying inflammation of the knee joint, the enlarged body prevented complete extension, interfered with flexion, and caused loud crepitus. Excision of the cartilage was followed by primary union and by good movement of the joint. This case seems to have been similar in its nature to the two instances I have related at page 203.

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## CHAPTER XVII.

### ON BONE SETTING.

CHIRURGERY, or hand-working, began, we may well believe, in attempts to pull in displaced bones, to straighten distorted joints, and to restore movement to stiff limbs. In this dawn of the art nothing was known of anatomy or pathology; it was only seen

that a limb was bent or stiff, and force was employed to overcome the defect, just as it might be used to straighten a crooked bar, or loosen a rusty lock. Soon, however, the primitive operators of those early days became ranged in two groups, the mere empirics who went straight to the point of trying what force would do, and those who endeavoured to ascertain the nature of particular cases, and the difference between one case and another ; those, in other words, who cultivated pathology and diagnosis in order that they might use force with circumspection. The results of practice conducted on these different lines can easily be imagined. The empirics, applying force in all cases alike, and thus involving their patients in a mere game of chance, did good whenever such untempered force as they could use was appropriate ; and harm wherever it was out of place : while those who used force only when they could see a reason for doing so, and when they thought it was safe, while they did little harm, often, as their diagnosis was very rudimentary, missed an opportunity of producing a cure. Under these conditions the empirics frequently had the best of it. Regular, but as yet very ill-informed, practitioners were so often beaten in their encounters with disease, that they lost credit in the public eye ; while the empirics, making the most of their cures, and not seldom laying the blame of their failures on the surgeon whose previous treatment they alleged had done all the mischief, were credited with powers that approached the miraculous. And we can understand their success, for every surgeon now well knows that instances are common enough in which pain and limited motion, resulting from sprains and other injuries, may at once be set right by even rough and unskilled movements, or indeed by an accidental wrench. Of this latter fact some illustrations are given below (page 220 *et seq.*).



At the present day irregular practitioners still continue to enjoy no small reputation by curing cases which, though they are a source of great inconvenience to patients, have been unwisely passed over by surgeons as too trivial for either careful diagnosis or serious treatment. Thus, although they are much less common than they were ten years ago, such cases as the following are still to be met with. A patient whose shoulder, three or four weeks after an injury, remains stiff and painful, as the result of the formation of slight adhesions around the joint, consults a surgeon. The surgeon examines him, and, finding that there is neither fracture, dislocation, nor inflammation, finding in short that there is nothing seriously wrong, prescribes rest and a liniment, and says that all will come right in time. But this is small comfort to a man who can neither dress himself nor raise his hand to his head, and whose rest is broken by pain in the limb. So, having waited in vain for the promised recovery for three or four weeks, or even for six months, he takes the advice of his friends, and goes to a bone setter. The bone setter says that the small bone of the shoulder is out, or that the "deltoid has slipped round to the front," puts him under an anæsthetic, and overcomes the resistance to movement, with the effect that the patient finds himself cured, while he is assured by his friend who was present at the operation that he heard a snap "when the bone went in." The conclusion from these plain facts is, in the eyes of the patient, obvious enough. He has, he believes, clear evidence, with every link complete, that the surgeon has displayed great ignorance and the empiric marvellous skill, and he is never tired of relating all the particulars of his extraordinary case. The explanation of such cases, which is very simple, is given at page 225.

*Taking much interest in manipulation as a means of*

surgical treatment, I have been at some pains to ascertain the manner in which bone setters conduct their practice, and to learn in what cases it is that they succeed. Bone setters, as would naturally be supposed, are a very miscellaneous group. Some are blacksmiths on the Cumberland hills, or shepherds in the sequestered valleys of Wales. Practitioners of this order, standing in the same relation to surgery that herbalists bear to medicine, have existed in these remote districts from immemorial times. At the other end of the scale are operators of a less unsophisticated stamp. Residing in large towns, and thought, without unwillingness on their part, by many of the public to be qualified surgeons, they equip themselves with the names of the principal bones and muscles, and with a few picturesque medical phrases, they procure a skeleton on which they undertake to show patients the precise nature of their complaints; they employ anæsthetics freely, and make full use of daily passive movements, rubbing and sham-pooing; they apply instruments, and in spinal cases they put on Sayre's plaster-of-Paris jacket. These individuals, however, are in the same position as the most homely of their order in this particular, that diagnosis, properly so-called, forms no part of their system. They merely say that a bone, or one of the "buttons of the back" (their name for the spinous processes) is out, that some muscle, such as the deltoid, has slipped round to the front; or that the fibula has slipped round to the back. Often if pressed for particulars they reply, "I can cure you, what more do you want?" A well-known operator, near London, now dead, used to say, as Dr. Wharton Hood tells us, "Don't bother me with anatomy; I know nothing about it;" and in a recent trial, one who was asked in open Court to articulate the tibia and fibula was unable to do so. This system of throwing of all cases into a

single class, and treating all alike by wrenching, though it leads to many cures, must of course present another side, of which the following illustrations have come under my own observation.

A lady with a very large subperiosteal sarcoma of the lower third of the thigh was told that her knee was out, and must be put in, and all the preparations for the operation were made, when a surgeon was consulted, and the necessity of amputation was explained.

A man, aged 32, was sent to St. Bartholomew's Hospital for an opinion about his shoulder. I found a large sarcoma of the upper end of the humerus. The patient had been told by a bone setter, under whose treatment he had been for two months, that his shoulder was out and could be put in as soon as the swelling was reduced by the lotions that were being applied.

In a case of far advanced angular curvature of the spine in a little girl, the buttons of the back were said to be "out;" the spine was straightened to put the buttons in, and the patient died a fortnight afterwards. I have three times been compelled to amputate scrofulous knee joints which had been forcibly wrenching by a bone setter, to "put the bone in."

Some of the cases, though the treatment does no harm, are equally clear evidence that diagnosis is not the bone setter's strong point.

A lady with an enlarged bursa over the tuber ischii was informed that her bone was out, and the part was manipulated to put the bone in. Another who was suffering from hæmorrhoids and pain about the sacrum was told that the last bone of her spine was out, and went through the process of having it put in.

A boy was brought to the Children's Hospital with an old sinus that was discharging near the hip. The mother stated that she wished this closed because *then she could go back to the bone setter*, who told her



that the hip was out, and that when the place was healed he would put the bone in. The case, however, was one in which the hip joint had already been excised.

With these and similar instances before me I wished to investigate the subject a step further, and I sent three cases for treatment. None of the three had anything the matter. The first was informed, on showing his elbow, that "his ulna was out," and having paid half a guinea for the consultation he was told to come back in a couple of days with two guineas when the bone would be put in. A second was told that his ankle bone was out, and having paid his fee of half a guinea was instructed to come back to have it put in. The third received exactly the same opinion and directions for the operation. The complaints from which patients are told they are suffering are often sufficiently alarming. A young man, suffering from slight lateral curvature of the spine, the result of inequality in the length of the two lower extremities, was told that his pelvis had opened and both his hips were out.

Some are disposed to credit the empirics with very skilful manipulations, and no doubt they acquire much facility in the mere handling and moving of the various joints; they know how to seize the limb, with all the art of a wrestler, and at such an advantage that, *coûte que coûte*, all resistance can be overcome. This kind of skill many bone setters are complete masters of, but it is a skill limited to the application of mere physical force. This is their strength. Their weakness is that they do not know whether they are applying their force in a suitable or an unsuitable case, in a case of sarcoma, cancer, or struma, or in a case of simple adhesions about an otherwise healthy joint.

That the practice of bone setters is entirely empirical and independent of diagnosis may seem an



unreasonable view to those who have been benefited by their treatment. On this point, however, some evidence has been already given in cases 1 and 2, related above (page 218). At least, the alternative construction that they knew what these cases really were, and yet proposed to subject the patients to forcible movement, would involve a much graver conclusion. Nor can it be questioned that excellent results may sometimes be obtained by haphazard wrenching and movement. Indeed, many cases might readily be furnished in which forcible movement, entirely fortuitous and unguided by any element of diagnosis, has suddenly produced a cure. A few examples may be shortly stated. A man, aged about 60, after bruising his shoulder and breaking a rib in a fall, was unable to put his hand on his head or to move his arm to put his coat on. Three months afterwards as he was climbing up to the front seat of an omnibus he slipped and hung for a moment by his stiff arm, which consequently was suddenly wrenched, so that his elbow was carried above his head. He was in great pain for a few hours, but next day he found that he had recovered the free use of his limb. A woman, after a fall on her shoulder, found the limb so stiff that she could not raise her elbow from her side. One day, about a month afterwards, she slipped as she was going downstairs, and clutched the banisters. Her arm was wrenched, and though she had severe pain for some hours, she completely regained the use of the limb. A school boy, aged eighteen, as the result of an injury some years before, had his elbow locked, so that he could not extend his fore-arm beyond an angle of  $130^{\circ}$ . When playing, one of his companions caught him by the hand and jerked him suddenly forward. He had severe pain at the elbow, lasting some minutes, but this soon subsided. He then found *that he had regained the power of extending his*

fore-arm, and the stiffness never returned. A girl, aged seventeen, who had had hip disease and sup-puration among the muscles of the thigh, was subsequently unable to bend her knee freely. I placed her under gas, and flexed the knee as far as I could venture, bearing in mind the probability that too much force might provoke a return of mischief in the thigh. Some stiffness remained, and I intended at a future time to bend the knee again. Two or three months afterwards the patient fell and doubled the limb under her. Pain was severe, and she was confined to bed for some days. When she got up she found she had recovered almost completely free movement of the knee joint, and this she has since retained. A man told me that after slipping down he found that his knee was locked, so that though he could bend it, he was unable to straighten it, and he walked lame upon the limb. Three months later, he fell on a ladder, and his knee, projected between the rounds, was violently wrenched. He afterwards found that he could fully extend the limb. Dr. Frank Hamilton records the following: "A woman, aged fifty-six, had dislocated her shoulder seven years before she came under the observation of Mercer, of Syracuse, who records the case. The dislocation was reduced, but the shoulder remained painful and almost useless for months afterwards. She could carry the arm forwards and backwards, but could not raise it from the side, or carry the hand behind her back, or raise it to her head for fourteen months. She gradually gained better use of her arm, but was still (seven years afterwards) unable to raise the arm more than half way to a horizontal position without pain or assistance, but with assistance the arm could be raised in any position without pain or resistance. Subsequently, in a sudden and thoughtless effort to raise the arm above the head, the muscles unexpectedly obeyed the will,

and the patient afterwards retained perfect use of the limb. Hamilton records this case as an instance in which the long tendon of the biceps had slipped. It was, however, I venture to believe, merely an instance of adhesions about the joint, for the bicipital groove would almost certainly have been obliterated in the course of seven years, and I have met with several cases in which exactly the same symptoms as Hamilton describes were undoubtedly due merely to adhesions. A patient told me the following, to my mind highly instructive, case. Many years ago, while he was at Harrogate, a gentleman was taking the waters for the relief of pain and stiffness about his shoulder, which was said to be out. While walking in the meadow in which the springs are situated, and which was then surrounded by a hedge and ditch, he was attacked by a cow. In this emergency, and following common usage, he endeavoured to escape by taking a running jump at the hedge and ditch. In doing so, and, so to say, throwing his stiff limb to the wind, he made a spring, and involuntarily carried his arm upwards and forwards, with the happy result of not only escaping from the infuriated cow but of "putting his shoulder in," for from that time he regained full power of movement. Who can doubt that this was a case of slight adhesions, ruptured by the sudden movement of the limb, or that the bone setter would have cured the patient just as the cow did, and with as little knowledge of the condition to which the pain and stiffness were really due?

Undoubtedly a great advance has taken place since the attention of the profession was first pointedly drawn to this subject of forcible movement by Sir James Paget in 1867. Nevertheless, though many surgeons are fully alive to the value of manipulation, there are some who are still apt to let cases escape their notice which this method would readily cure,



and who are therefore liable to have their surgery amended either by a bone setter, an infuriated cow, or a tumble down stairs, for, as I have shown above, all these agencies may, by rupturing adhesions, or rousing torpid muscles, effect a cure which no amount of rest, or liniment, or other form of masterly inactivity, will suffice to produce.

A main influence in checking the use of manipulation has been the impression that the force employed may often do more harm than good. Undoubtedly this is a real danger unless care is taken in the selection of appropriate cases. Here, as in so many other instances, everything turns on a proper choice of cases. And the key to this lies in the fact that whenever a joint in itself is, or has been, seriously diseased, manipulation is generally either useless or mischievous, for no amount of force can restore the structures to a condition in which they can resume their functions, while any force that is used is very apt to provoke a renewal of disease. On the other hand, there are numerous cases in which the joint itself is healthy, or not materially damaged, though its movements are restricted by some abnormal conditions chiefly affecting the surrounding structures, in the form of adhesions about the capsule, the sheaths of tendons, or the intermuscular areolar tissue. These adhesions, although they are sufficient, through the pain they induce on movement, to prevent the use of the limb, are as slight and as easily ruptured as are the adhesions found, *post-mortem*, in cases of recent pleurisy or peritonitis. It is in these cases, and in some other instances given below, that manipulation is so strikingly successful. Indeed, it may be regarded as an axiom that the good to be obtained is, in the great majority of cases, inversely proportionate to the amount of force that is required.

An anæsthetic should be given for all but the



slightest cases. Gas is usually sufficient. By abolishing muscular resistance and enabling the surgeon to bring the greatly diminished amount of force which is required when the muscles are relaxed to bear directly on the obstacle to motion, whatever that may be, anæsthetics have rendered manipulative treatment an entirely different operation from the rough proceedings which in former times were so often followed by unfavourable results. Cases are frequently met with in which force that could be exercised almost with the finger and thumb, when muscular relaxation has been secured, is sufficient to restore free use to a limb that has been for months entirely disabled by stiffness and pain on any attempt at movement. On the other hand, in those instances in which a limb can be bent only by considerable force, the synovial membrane has been destroyed, and the articular cavity obliterated by fibrous adhesions. Here, although the cicatrix by which the joint is replaced may be torn through, little or nothing is gained. Manipulation, of course, can do nothing to restore the lost synovial membrane or its functions, and the lacerated cicatrix will obstinately tend to re-unite, even if it does not, from the violence to which it has been subjected, become the seat of a renewal of active disease. When the supreme importance of differential diagnosis is fully recognised, and the point is realised that in cases which are suitable for this method (and they are of almost daily occurrence in the practice of any large hospital) only very slight force is required, manipulation will reach the position it deserves, and will be regarded as one of the most valuable and indispensable forms of treatment to be found in the whole range of minor surgery.

The following are the principal groups in which manipulation should be practised :

1. Cases in which, after sprains or other injuries, adhesions have formed around a joint that is itself in a healthy state. A boy, aged 10, fell and wrenched his hip. For a fortnight he was in bed at home, lying with his knees drawn up to his chest. His mother then found that, though the pain had ceased, the boy kept his thigh flexed upon his trunk. Afterwards he came into St. Bartholomew's Hospital. Mr. D'Arcy Power, then house-surgeon, found that, though it was freely movable in every other direction, and though the head of the femur rotated freely in the acetabulum, the limb could not be extended beyond a right angle without causing severe suffering. When chloroform was given, and I proceeded to extend the thigh, the resistance suddenly gave way with an audible tear, which I also distinctly felt, and the limb fell by its own weight into a line with the trunk. A few days later all the movements of the limb were absolutely free and painless. Here, in the accident, some laceration of the capsule or other soft parts in front of the joint had occurred, and, as the boy lay with the limb flexed, adhesion, preventing extension, had formed. These were readily separated by manipulation, and complete recovery ensued. This case is reported as one that shows all the main features of a highly important group.

A man, aged 45, slipped and sprained his ankle, and was laid up for three weeks. He then began walking with sticks, but was very lame. Some improvement gradually took place, but the ankle remained, month after month, shapeless from chronic swelling, the skin was tense and shining, and the joint was so weak that he could bear no weight upon it. Nine months after the injury he came to the hospital, walking with a stick and using his wife for support. The joint was "weak;" but it was perfectly cold to the touch than

the opposite limb. The foot was in a position of slight equinus. When he had inhaled gas I carried the foot through all its normal range of movement. At first I met with elastic resistance, and as this yielded to very moderate force, I felt numerous adhesions giving way, and minute deep-seated snaps and cracks were heard. No pain followed, and the patient the same afternoon walked about the ward. A week later he reported himself as being quite well.

Many similar examples, were it necessary, could be related, but these may be regarded as typical.

2. Cases are often met with in which subacute rheumatism is followed by stiffness and severe pain (greatly aggravated on the slightest movement) about the shoulder, but in which gentle passive motion through a limited range of rotation, or movement of the elbow backwards and forwards, but without any attempt to raise it, shows that the cartilaginous surfaces glide smoothly on each other; in other words, that the stiffness and pain are due not to conditions within, but to adhesions outside, the joint itself. Signal benefit is the immediate result of manipulation in these instances.

A man, aged 46, came with what he had been told was rheumatic disease, of four months' duration, of his shoulder joint, which was of a mahogany colour from prolonged painting with iodine. He could not move his elbow for two inches in any direction, and every attempt gave him severe pain. He could not lie on that side, and pain at night was so severe that he could obtain but little sleep. The surrounding muscles were considerably wasted. I found, when the limb rested quietly in my hand, that the head of the humerus rotated with perfect smoothness through a slight range in the glenoid cavity, and that the elbow could be moved forward and backward for some three or four inches. Having thus learnt that the joint itself was



healthy (free movement, though limited in its range, conclusively proved this), I proposed to manipulate the limb. The mere suggestion of such a step, however, so alarmed the patient that he declined the treatment; but, getting no better, he returned a fortnight later. I then, when he was under gas, first rotated the humerus in the glenoid cavity to its full normal extent, and then carried the limb through its other movements, *i.e.* forwards, backwards, and upwards, performing the upward motion by a series of short jerks. Numerous adhesions readily gave way. The patient suffered a good deal of pain for ten or twelve hours, but within a week he was able to put his coat on. Three weeks later, as some stiffness remained, he inhaled gas, and I again moved the arm in the directions in which I found resistance. In a month from this time he reported that he had lost all pain, and that only a very slight restriction of movement remained.

A lady, between forty and fifty, had been suffering, in 1882, from rheumatic disease (she was told) of her left shoulder joint for six months. When first seen, her arm was fixed to her side; the slightest motion gave her intense pain, and she often suffered with such severe spasms and cramp in the muscles of the arm that she was obliged to cling to any firm object near her, in order to avoid falling down. Pain rendered her nights almost sleepless. She could use the arm only from the elbow. Finding by the tests just mentioned that the joint was sound, I manipulated the arm, under gas. Many adhesions were felt to give way. Pain was severe for some hours, but a chloral draught relieved this. Next day she said the former pain and spasm had entirely left her, though the joint felt sore. Within a week she could get her dress on and sleep on that side, and in a fortnight she considered herself cured.

In these cases diagnosis must be very carefully



made, for if an instance of progressive rheumatic disease of the joint itself is mistaken for one of adhesions around the joint, no benefit, but rather a severe aggravation of the disease, will be produced.

3. Cases in which joints have been left stiff after acute or subacute rheumatism, owing to the formation of intra-articular adhesions. These adhesions are often slight and easily give way, and manipulation is followed by the restoration of completely free movement. Even when adhesions are so firm that some considerable force is required, good motion may be regained. In a man, aged 22, whose right lower extremity, as the result of a prolonged attack of rheumatic fever, had become drawn up, so that the thigh was fully flexed on the abdomen, and the leg on the thigh, and fixed as completely as if bony anchylosis had occurred, I used some force in moving both the hip joint and the knee (I had ascertained that the patella was movable) (page 297). The adhesions at the hip gave way with a snap as if the femur was broken, yet, in a few days, the joint admitted of smooth movement through a considerable range. The knee also regained motion to a very useful extent. Cases of joints stiff after gonorrhœal arthritis are mentioned at page 24. In these manipulation is often attended with very good results.

4. Cases in which joints remain stiff and painful after fracture in their neighbourhood. James R—, aged 28, labourer, sustained Colles's fracture of the fore-arm, and after being treated at an infirmary for five weeks was told the fracture was repaired, and he was discharged. Three months later he came to the hospital, saying that he was unable to use the hand, and that he was starving in consequence. The wrist and fingers were quite stiff, and the muscles of the fore-arm much wasted. The fingers were manipulated when he was under gas, so that each joint was bent,

and the wrist also was carried through the full range of its various movements. Two days afterwards he began work, and in a fortnight had regained full use of his limb. This case represents a very numerous class, in many of which, however, the impediment to motion is so slight that movement of the joints under gas, which would greatly facilitate the later stage of recovery, and add much to the patient's comfort, is omitted even by those who in other cases are fully alive to the value of this treatment. All would do well to follow the excellent rule laid down by Mr. Christopher Heath,\* that our duties in a case of fracture should be considered to end, not when the bone is found to be united, but only when the functions of the limb have been, as far as possible, restored. At present many a patient is disabled for several weeks or months, or even permanently, whose limb might be restored to usefulness in a few days by manipulation. Nor need it be feared that manipulation will do any injury to the recently united fracture. It should not be practised until after the lapse of a month in children, or six weeks in adults. Then, if the fracture is supported, and no undue force is used, the proceeding is perfectly safe.

5. In instances of stiff joints after dislocation, whether of the shoulder, the elbow, or the hip, the articulations most commonly involved.

C. M., aged fifty, dislocated his humerus by a fall. Reduction was easily effected, and the arm was bandaged to the side in the usual manner. I first saw him nine weeks afterwards. He could not move his elbow from his side three inches in any direction, and the limb ached so much at night that he could not sleep, and if the arm was jarred he cried out with pain. Two operations of manipulation, with an interval of a fortnight between them, restored the full use of his limb, and removed all his pain. In old

\* "Minor Surgery," p. 297. 8th ed.

unreduced dislocations manipulation is often followed by relief of severe pain, and by greatly increased freedom of movement, in consequence of the rupture of adhesions.

6. In cases of dislocation as of fracture, Mr. Heath's rule of not only attending to the primary injury, but of relieving the patient as far as possible from the resulting impairment of the use of the limb, should be borne in mind. Much good is sometimes done by breaking down adhesions in cases of unreduced dislocations, especially about the shoulder and the hips; position may be improved, and a wider range of movement secured.

7. In instances in which bruised or over-strained muscles remain passive and rigid, or in which the patient is afraid to exert a strong mental effort to move the limb. Robert D—, aged 22, came to the hospital with his right knee, which he had wrenched eight weeks before, in a position of full extension, and covered with neatly applied moleskin strapping. He said that he had attended for two months at a hospital, and had applied many different lotions, but without benefit. At length the joint had been, as I found it, skilfully strapped, and he had been told to rest the limb. On removing the plaister I noticed that the joint was cool and perfectly normal in appearance. Under gas it moved into full flexion, with the mere guidance of the hand, unaided by any appreciable force. No adhesions were felt to give way. On being told that the joint had thus been moved, the patient cautiously attempted to bend it, and, gaining courage, was able to flex it completely, and to walk freely on the limb. Next day he went out walking naturally, and said he was cured.

A lad of eighteen fell from his bicycle, and bruised his arm. Three weeks later I found his *fore-arm* fixed at an angle of about  $110^{\circ}$ , and his



elbow stiff. The joint, however, was perfectly natural to look at, and free from both heat and swelling. Under gas the arm moved as readily as a healthy limb can be moved during sleep, and on recovering from the anæsthetic the patient discovered that he had regained full command over the part, and next day he was discharged.

8. A similarly inert condition of the muscles, requiring the same treatment, is met with in cases in which a limb has been too long maintained upon a splint.

9. Manipulation should be employed when from the history of the case it is believed that a tendon or muscle has become displaced. Early in the present year a boy of eighteen came to the out-patient room with his head strongly turned towards his left shoulder, and his chin elevated. He said that while washing his face and neck that morning, he felt a sudden "catch" below his right ear, and his head became fixed in its present position. Any attempt, I found, to restore the head to its normal direction gave him severe pain, apparently about the transverse processes of the upper cervical vertebræ. Believing one of the tendinous slips connected with the transverse processes had been thrown out of place, I had gas administered, and I extended the head, and brought it into its normal position, and also manipulated the muscular substance of the upper part of the neck with the finger and thumb. On recovering from the gas the patient reported that all his symptoms had disappeared, and turning his head about in all directions to demonstrate the fact, cheerfully wished us good day.

The following was, I believe, a very similar example, though at the time I was quite deceived as to its real nature. A. B—, aged 17, was sent with a suspicion that he had hip disease. He was very lame, and walked with a crutch and a stick, bearing no weight on the limb. The thigh was slightly flexed, abducted, and



rotated outwards. There was deep-seated pain at the back of the joint on movement, and tenderness on pressure in this situation. There was no swelling. On examination I found the hip joint was movable in every direction, and evidently sound, and I concluded there was periostitis of the ilium beneath the external rotator muscles. I prescribed three months' rest, blisters, and cod-liver oil. At the end of this time he was no better; his condition seemed wholly unaltered. His friends now took him to a bone setter, who, after examining him by passing his hand under his trousers, pointed to a spot in the thigh directly in a line with, and four inches below the anterior iliac spine, at which he said a bone was out. At the request of the boy's mother he "put the bone in" by moving the limb, a snap being heard at the moment.\* The patient could now move his limb freely, and walk upon it, with only slight pain, and this disappeared in two or three days, and left him quite well. Just twelve months later, having in the interval remained quite sound, he was asked while at breakfast to cut some bread, and rising quickly to do so, was suddenly attacked with his former symptoms. He had severe pain in the old spot, and felt sick and faint. The limb was locked in a similar position, and he had intense pain if he threw weight upon it. Getting no better, he was brought to London at the end of a fortnight. The limb was then stiff, slightly flexed, and abducted, and he walked with a crutch and a stick. Movement of the limb brought on very painful

\* The snap often heard, when a joint that has long been fixed is suddenly moved, is pointed to by bone setters as a plain demonstration that the bone has gone in. These snaps, however, are not due to the concussion of two joint surfaces as they are returned into contact; but, on the contrary, to the separation of surfaces which have become stuck together by dried and inspissated synovia. Many persons can make their fingers crack by pulling at them till the joint surfaces suddenly separate.

spasmodic contraction of the muscles, and he suffered severely at night from startings and twitchings of the thigh. There was no swelling, but pain was excessive on pressure over the neighbourhood of the sciatic notch. Having heard how he was cured before, I put the boy under gas, and moved the limb through all its natural range of flexion, extension, abduction, adduction, and rotation. I felt nothing give way, and nothing seemed to slip; but when the patient recovered from the gas all his symptoms had disappeared. He could move his limb freely, and in a few days had lost all his lameness and pain. He has had no relapse. This case seems a very instructive one. Looking back on it I think there cannot be much doubt that it was an instance in which one of the external rotator muscles had slipped out of place.\*

Probably, however, the instances in which a joint is disabled by displacement of surrounding muscles are very rare.

10. Cases of slipped interarticular cartilage are described at page 190 *et seq.*

11. Manipulation, with the strong mental impression it produces, is a very good method by which to treat so-called cases of hysterical contraction of the joints, such as the following: A girl, aged fourteen, who had fallen and wrenched her limb, was brought with her knee so tightly flexed that the heel touched the tuber ischii; but the joint was perfectly natural in appearance, and entirely free from either heat or swelling. Feeling sure the contraction was due merely to muscular rigidity, depending on a mental impression, I pretended to search for and find a particular spot in the ham, and pressing my finger strongly upon the

\* In Sir James Paget's "Clinical Lectures and Essays" full reference is made to the displacement of tendons (pp. 88, 469). Want of space forbids me to follow out this subject in the present work.

surface, I ordered the girl to straighten the limb. She did so immediately, and then, while pressure was continued on the pretended faulty spot, walked round the room. She had no relapse.

A servant, aged 17, after she had pricked her third finger, had kept it tightly flexed on the palm for two months, and protested that she could not straighten it. Seeing there was nothing the matter, I pretended to pass electricity through it by pressing two sponges in holders (but not connected with the battery) upon it. She immediately straightened her finger, and was quite cured. Although movement under gas was not the method adopted in these cases, they belong to a group in which it is highly efficacious.

This subject might be followed at much greater length, but space will not permit ; and I can only offer a few remarks as to the symptoms and general aspect presented by cases in which the surgeon should advise manipulation.

The first step must be to ascertain that the joint itself is not at the present time diseased, and that it has not at any former period been the seat of disease by which the structures of which it is composed have been seriously changed or impaired. An opinion on this point must be drawn from the history of the case, and a very careful examination of the part in respect to the amount, character, and disposition of the swelling, and as to the degree of movement. Another highly material point is whether the joint is hotter than normal. Joints that are suitable for manipulation are either free from abnormal heat (many are abnormally cold, and the circulation of the skin is sluggish, so that the skin is of a dusky-blue tint), or, if any heat follows exercise, it quickly subsides with rest.

The absence of the evidences of disease in the *joint*, together with the fact that the limb is



nevertheless disabled, should induce us to resort to manipulation. I have seen many cases in which, though a precise diagnosis of the exact condition present could not be arrived at, but in which serious disease of the joint could be excluded, manipulation produced immediate recovery. This was notably so in the case of A. B—, page 231. At the time I manipulated the limb, although it was clear that his hip joint was sound, I was quite unable to say to what his symptoms were due.

A man, aged twenty-eight, whose ankle was stiff eight months after a severe sprain, came to the hospital in 1880. The joint was manipulated, and within an hour he could walk with scarcely a limp. Next morning he walked from Hackney to Smithfield; he reported himself cured, and had already applied for work under his former master. Six months after this, he returned to the hospital with his ankle again out of order. He said that since the manipulation he had been at work, and had felt no inconvenience till within the last three weeks, when the joint had become "stiff and weak," and so painful under any weight that he was very lame. On examination, neither heat, swelling, nor any appreciable defect of movement could be detected. He was, therefore, told that manipulation would do him no good, and that he had over-worked the joint, and had better have it strapped and give it a week's rest. He looked disappointed, and said that his joint felt just as it did when he was laid up before, and that he believed that if it was moved again he would be "all right." This was an appeal to which, as manipulation would do no harm, it seemed unfair not to yield. He took gas, and the ankle was flexed and extended. When flexion was being performed, some adhesions, which, however, were slight, and offered scarcely any appreciable resistance, were felt to give way. He left the hospital an hour afterwards,



and the next morning wrote, "I have had enough travelling on my foot to convince me that it is wonderfully better, by my being able to walk without *pain* or *limping*" (he had underlined these words), "which might seem strange, but it is a fact." The adhesions which disabled the joint were so slight that I failed to detect any limitation of movement, though I remembered what the former condition of the joint had been.\*

A girl, aged twelve, came to the out-patient room in 1881 with reported hip disease, following a fall nine months previously. She walked on her toe, kept the joint habitually a little flexed, abducted, and rotated outwards, and complained of pain when weight was thrown on the limb. On examination I was surprised to find that the movements of the joint were perfectly free in every direction, except that adduction was very slightly restricted, and produced a little uneasiness. Enarthrodial movement was perfect. There was no muscular wasting, a feature incompatible with hip disease of nine months' duration. Not knowing on what the symptoms depended, whether on slight adhesions after the fall, a displaced muscle, or "hysteria," I put the child under chloroform and moved the limb in all directions. I felt nothing give way. Next day every trace of restriction of motion had vanished, and the girl went out of the hospital. The symptoms never returned. I believe the case was one of slight adhesions, that had formed after the fall.

Many are, I believe, in doubt whether the stiffness left after recovery from strumous disease of the hip and other joints should not be treated by manipulation under chloroform. I venture to say that no such step should be taken. I have never, I think, seen it succeed.

\* Clin. Soc. Trans., vol. xiii. p. 221.

The joints so treated usually become stiff again, and, in many, a renewal of disease is excited, and suppuration is extremely likely to follow. I have (page 218) amputated three limbs in children on account of acute arthritis following the manipulations of bone setters; and the following is a further case in point. A girl, æt. 7, had been lame for six months after a mild attack of inflammation of the hip joint. The limb was considerably drawn up, so that the toe did not touch the ground. She walked with a crutch, but had no symptom of still-present disease. A bone setter said her hip was "out," and put it "in" under chloroform. She was said to be cured. The immediate result was satisfactory, for the limb was now very nearly straight, and she could walk without her crutches, though she still limped. The father told me afterwards that, at the time, he thought it a providential thing that the surgeon he had proposed to consult was away from home, so that his steps had been turned in another direction. In the course, however, of three weeks, pain and startings, and restless nights came on, and the child could not put her foot to the ground. Three months later, when I first saw her, the limb was considerably flexed, and there was a large abscess in front of the joint.\* The deformity in this case might probably have readily been removed by the method specified at page 397 *et seq.* As a very general rule, manipulation will do harm rather than good if employed in joints affected with chronic rheumatism (but *see* page 228) or osteoarthritis. (*See* page 73.) The value of gentle passive movement is alluded to at page 69. The manner in which each joint should be manipulated is alluded to at page 297. The method to be employed for slipped semilunar cartilage is given at page 210.

\* St. Bartholomew's Hospital Reports, vol. xiv. p. 208.

## CHAPTER XVIII.

## CONGENITAL DISLOCATION OF THE HIP.

THE general subject of congenital dislocation of the joints falls under the head of orthopædic surgery, and will not be considered in the present work. I shall, however, offer an account of the condition known as congenital dislocation of the hip, for this affection occupies an exceptional position. It is far from uncommon, and is met with in individuals who are otherwise healthy, while congenital dislocation of other joints is extremely rare, and is found chiefly in combination with other deformities, or with defective development of the central nervous system (*i.e.* in acephalous and other monsters): it is on account of its reputed rarity and the obscurity of its features in many instances, apt to be overlooked or mistaken for some affection of an entirely different kind, whereas congenital dislocation of any of the other joints is characteristic and offers no difficulties in diagnosis.

Although Hippocrates expressly refers to intra-uterine dislocation of the hip joint, and though many early writers have alluded to the subject, it is to the great French surgeon, Baron Dupuytren, that we are indebted for the first detailed description of this affection; and he it was who termed it original or congenital dislocation in order to distinguish it from those displacements which are due to accident, and those which result from disease. As we so often see when a novelty is being dealt with, Dupuytren's description was drawn from the most typical and obvious examples, and contained no reference to instances which, although they



are less marked, yet constitute a much more numerous group. Hence a somewhat too narrow conception of this affection has been accepted, with the result that many instances are overlooked, or mistaken for some other disease. In treating the subject I shall, therefore, have to describe varieties to which Dupuytren in his paper does not allude. The main points observed in such typical cases as Dupuytren recorded\* are the following, which are noticed in his work. The condition is much more common in females than in males. Usually both hips are affected. The gait is peculiar and, to the experienced eye, characteristic. It consists of a rocking or rolling movement of the trunk from side to side, which has been compared to the waddle of a duck, or the motion of the hind legs of a cow during a trot. In walking the individual steps on the points of the feet, alternately inclining the trunk very much towards the limb on which the weight of the body is thrown. Each time this occurs the pelvis sinks upon the corresponding thigh bone, and all the signs of dislocation become more marked on that side and less apparent on the other until the translation of weight to the opposite limb reverses these conditions. "The labour with which these individuals walk would naturally lead one to expect that the acts of running and leaping would be still more difficult to them; yet this is not so, for in executing these efforts the energy of the muscular contraction, and the rapidity with which the weight of the body is transferred from one limb to the other render the effects, arising from the unstable condition of the heads of the thigh bones, almost inapparent." It is true there is an unusual rocking of the body from side to side, but even this is less seen in the act of leaping. The shoulders are thrown back and the abdomen forward, and there is marked, often

\* Dupuytren: "Diseases of the Bones." Sydenham Soc., 1847.



extreme, lordosis. The patient is short in stature, and, as the arms hang down, the finger tips reach nearly to the knee instead of corresponding, as they naturally do, with about the middle of the thigh.

On examining the hips, let us suppose in a male



Fig. 33. - Congenital Dislocation of the Hip Joint. The acetabulum is absent, so that the femur moves loosely upon the pelvis. The head of the bone, however, is enclosed in a very strong capsule. (From a preparation in St. Thomas's Hospital Museum.)

whom we are at liberty to strip, all these peculiarities are easily explained. The natural ball-and-socket connection of the lower extremity with the trunk is found to be entirely wanting (Fig. 33); so that the upper end of the femur can be moved freely about on

the side of the pelvis, through a range of from half an inch to, in some cases, as much as four inches, and in such a way that the length of the limb can be made to vary to a corresponding extent by being pushed up and drawn down again. In children, and in adults if

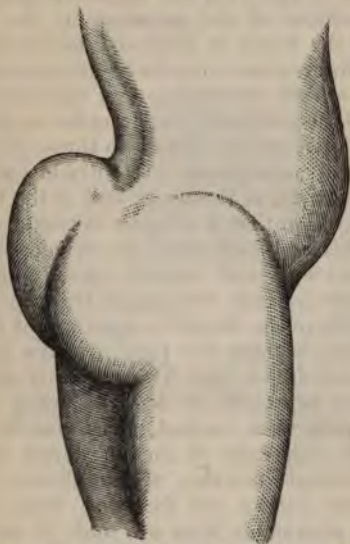


Fig. 34.—Congenital Dislocation of the Hip Joints. (From the cast in St. Thomas's Hospital Museum.)

the individual is not very stout, it can generally be ascertained that the head of the femur is small and the neck short; that, in fact, the upper end of the bone is rudimentary. When, as in standing, the weight of the trunk is thrown on the limb the pelvis sinks, so that the great trochanter is considerably above Nélaton's line, the trunk is apparently shortened, and the extended fingers approach the knees. Viewed

from behind (Fig. 34) the hips are very broad, an appearance due to the projection of the trochanters much above their normal level, and to the consequent displacement and bulky fulness of the glutei and neighbouring muscles. As the head of the femur is situated not only above, but considerably behind, the natural position of the acetabulum, the centre of gravity of the trunk is displaced forwards, and the pelvis undergoes rotation on its transverse axis, so that it becomes almost horizontal, with the result that not only is lordosis produced, but, in order to preserve his balance, the patient is obliged to throw his shoulders far back, and consequently to protrude his abdomen. At the same time, as the upper end of the femur is in the same position that it occupies in traumatic dislocation upwards and backwards on the dorsum ilii, the thigh is adducted and rotated inwards, and as both sides are affected, the two limbs tend to cross each other just above the knees, in a posture of aggravated genu valgum, so that the patient walks on his toes with his heels drawn up. This obliquity of the limbs is increased, especially in females, when the pelvis widens as puberty is reached. The waddle is due in part to the existence of double dorsal dislocation, and the altered direction of the thighs; but to a large extent also to the fact that when the body is thrown alternately from one limb to the other it oscillates widely before it meets with firm support, owing to the want of any bony connection between the trunk and the lower extremity. The lower limbs are seen to be small and wanting in muscular development, and have the appearance of being unnaturally short. Fig. 35, taken from a specimen (1050) in the Museum of St. Bartholomew's Hospital, illustrates in a very striking manner all the principal features of the condition. The history of the case is not known. The pelvis is that of an adult

female. The head of each femur is dislocated upwards on the dorsum of the ilium. The capsular ligaments form strong sling-like bands, by means of which the pelvis was suspended between the two thigh bones. There is no trace of the ligamentum teres. The heads of the femora are small and irregular in outline. In the position of the acetabulum on each side is a shallow



Fig. 35.—Congenital Dislocation of the Hip Joints.

irregular depression, much smaller than the natural joint cavity, and filled to the level of the surrounding bone with fibrous tissue. Above and behind this is an oblong patch, where the bone has evidently been worn down and roughened by the friction of the head of the femur, which, instead of being fixed in a socket, was free to slide on the side of the pelvis. The thigh bones, which are slender, are adducted and rotated inwards, so that they cross each other above the knee,



and the *lineæ asperæ* look directly outwards. The lumbar vertebrae, three or four of which are preserved, show, from their relation to the sacrum, that lordosis must have been extreme. The gait of this individual must have been exactly like that which Dupuytren observed in his cases.

The instances, however, of the deformity which reach this extreme degree are comparatively rare. In the majority of cases, though the femora are displaced, they are either retained in their abnormal position by a more or less perfect false joint, or they are connected with the pelvis by a strong and short capsular ligament, so that they slide on the *dorsum ilii* to only a limited extent; when the latter is the case, or when there is no sliding at all between the thigh bones and the pelvis, the roll from side to side, and the difficulty and labour of progression are very largely diminished, and the deformity of the lower extremities to a great extent, or entirely, disappears. The following is an example:

C. K., a girl four years old, was first observed to be the subject of some peculiarity at the hips when she began to walk at the age of about two. On examination, displacement of the thigh bones was found to be double and symmetrical. Their upper ends could be felt to consist of a small stunted head and a short neck resting on the *dorsum ilii* above and behind the normal side of the *acetabulum*. The heads were fixed so that they could not be made to slide on the wall of the pelvis. The hips looked unnaturally wide and prominent when viewed from behind, and lordosis was well marked. The lower limbs were in fair proportion to the trunk and arms, and fairly muscular; and there was no tendency to knock knee or inversion of the feet. Though showing a characteristic roll in her gait, this was not very conspicuous, and she could walk and run without difficulty or fatigue.

The position which the femur occupies in relation to the side of the pelvis has an important influence alike on the amount of deformity, and on the patient's power of locomotion. When the femur is situated far back on the dorsum ilii, the pelvis, from displacement forward of the line of gravity of the trunk, is rotated on its transverse axis, and lordosis is produced. In many examples, however, the false joint is situated immediately above, or even slightly in front, of the normal position of the acetabulum; when this is the case, lordosis, and the throwing back of the shoulders and protrusion of the abdomen, are either absent or very slight, and instead of being flexed, adducted and inverted, causing the patient to go on his toes, the lower extremities admit of extension so as to occupy a vertical line with the trunk, and are free from adduction and inversion, and the heels come easily to the ground.

In these milder cases the only symptoms are that the patient has a peculiar gait, with more or less of a roll from side to side; that walking and running are performed with more than natural effort (but this defect may be extremely slight), and that movement is a little insecure, so that the patient is apt, especially during childhood, to trip, or tumble about. While, on examining the hips, the trochanters are found above Nélaton's line, and either just above the natural position of the acetabulum, or close to the anterior superior spine of the ilium. Sometimes, by inverting the limb, the head of the femur, which may be apparently either normal, or small and misshapen, can be readily felt rotating in a shallow false joint. Sometimes, also, a little sliding may be detected on one or both sides, especially when the thigh is flexed on the trunk. The general direction of the limbs, however, is perfectly natural, and their muscular development shows no defect. Movement is free

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in every direction, except that abduction and rotation outwards are a little restricted. As the position of the head of the femur on the two sides is sometimes not quite symmetrical, one limb may be a little shorter than the other. The following is an illustrative case :

M. B., aged five, began to walk when about sixteen months old. She is very healthy, and able to walk and run as actively as other children. Her carriage is somewhat peculiar, and there is a slight roll from side to side; but this might easily escape notice unless it was especially looked for. As she stands, the only deformity seen is some little lordosis. The pelvis and limbs are fairly developed, the heels are flat on the ground, and there is no inversion of the feet. When she is recumbent the limbs look natural in every way except that the left is a little shorter than the right. On examination of the hips, the trochanter is felt on each side on the dorsum ilii on a level with the anterior superior spine, and about three-quarters of an inch behind it. The neck of the femur is shorter than natural, and the head, which appears to be rudimentary, small and flattened, is closely held down by short and strong ligamentous tissue. Movement of the limb is free in all directions, except that rotation, both internal and external, is somewhat limited. Even when the thigh bones are free to slide widely on the side of the pelvis, the actual symptoms may be so comparatively slight that the nature of the case may be misunderstood.

The following is not only a remarkable example of congenital dislocation, but it forcibly illustrates the above remark. The notes were taken in 1874 :

Mrs. B. is now thirty-six. She says that she could not walk till she was two and a half. She was then found, as she has since continued, lame, and was *noticed to walk* with a peculiar roll. When seven, she



was taken to Sir Benjamin Brodie, whose opinion was that she had congenital dislocation of both hips, and that she should be treated first by confinement for six months in the horizontal posture in combination with some means for keeping the limbs extended, and afterwards by the use of instrumental supports. This scheme was never carried out, and she was left for whatever improvement in her walk might come with time and exercise. As she grew up she was gradually able to walk much better, and her lameness troubled her less and less. When old enough, she was employed to serve at a counter, and she followed this occupation till a few years ago, when she married. She is now robust and strong. She says she has always been active, and has frequently walked distances of ten miles, feeling then, as well as after standing many hours at her counter, only moderate fatigue. At the present time, her carriage, though peculiar, would, as she has grown stout, scarcely attract the eye, unless particular attention was drawn to it; but then it would be noticed that the shoulders are thrown back, the abdomen is prominent, the loins hollow (lordosis), and the lower limbs too short to be in due proportion to the trunk and arms, so that the hands come nearer than is natural to the knees. Her gait presents little of the rolling movement from side to side that is usually seen. There is no knock knee, the heels come fairly to the ground as she stands or walks, and the feet are not turned in. As the connection of the lower extremity with the trunk is essentially the same on the two sides of the body, one description will suffice for both. The head and neck of the femur seem to be in great part, or wholly, absent, so that the upper end of the bone is a mere stump. The femur is so movable that, as she stands on one leg, the patient can, by a muscular effort, shift the opposite femur on the dorsum of the ilium, first drawing it nearly



vertically upwards, for nearly four inches, and then letting it suddenly drop down again. When she does this, surfaces of bare bone are felt rubbing upon each other. As she stands, the pelvis, weighted with the trunk, sinks down between the two uprights formed by the thigh bones till it is suspended, and then the trochanters, may be felt about three inches behind the anterior iliac spines, and on the same horizontal level with them. In other words, the trochanters are opposite, though standing away from, the dorsum ilii above and a little in front of the sacro-iliac notch. Lordosis is very marked. The glutei, pushed up by the femur, stand out in a mass, which gives the posterior aspect of the hips an appearance of remarkable width. When the patient is recumbent, the femur so readily slides on the pelvis that the length of the limb may be varied through a range of nearly four inches. The limbs lie in a position of complete extension, and there is no inversion of the feet. The pelvis is of ample size, and the patient's confinements have followed quite a natural course. Mrs. B. was the mother of M. B. (page 246). The hereditary transmission of this defect is alluded to at page 254.

In all the cases I have hitherto related the deformity has existed on both sides. Many instances, however, are met with in which only one hip is affected. From what I have seen, indeed, single is more common than double dislocation, a circumstance that I wish especially to direct attention to, as cases of unilateral deformity are those that are most often overlooked or misunderstood. In these patients the affected side presents precisely the same anatomical variations as those observed when both hips are involved. There may be entire absence of anything like a joint; and the truncated upper end of the femur may slide freely about; or the head of the femur may be of its normal size, and firmly retained in a false joint, close above the

natural site of the acetabulum ; while between these extremes of total and slight defect all intermediate degrees are occasionally met with. The patient's carriage and powers of progression will, of course, vary with the condition of the hip. When there is no joint, and the thigh bone is free to slide about, the child drops towards the affected side with a limp as marked as that accompanying infantile paralysis of the limb ; while in cases of slight anatomical defect the use of the limb is very little impaired and lameness is proportionately diminished.

The two following cases are instances respectively of the severe and slight grades of this form of dislocation. Fanny B., aged three, seen in 1872. Her history as given by her mother was that she began to walk at fifteen months old, when she was found to be, as she has since continued, lame on the left side. She is a strong, healthy child, except that she has chronic eczema, for which she is brought to the Children's Hospital. She can walk and run fast, and has never had pain or any other symptom of defect at her hip joint, except her lameness. Her gait is like that of a child who has one limb shorter than the other, and flexed on the pelvis as it might be in the later stage of hip disease. Lordosis is well marked, and her body drops to the affected side when she bears weight upon the limb. She is very lame. On examining the limb, which is somewhat wasted, it is found, when the child is recumbent, about three-quarters of an inch shorter than its fellow, and it can, if it is thrust by moderate pressure upwards, be made an inch shorter still, and the trochanter is felt above and a little in front of the sacro-sciatic foramen. The upper end of the femur appears to have only very loose connections with the pelvis, for it can be brought outwards so that it projects very distinctly beneath the glutei and the integument. As it moves on the

dorsum ilii, grating can be felt as if rough bony surfaces imperfectly covered with ligamentous tissue were being rubbed together. The usual movements of the hip joint are quite free in all directions, except that abduction is limited and the limb cannot be brought into complete extension. The upper end of the femur feels shapeless and knob-like, as if the neck were short and the head flattened and rudimentary. As the child lies the posture of the limb is quite natural, except for slight flexion on the pelvis, and there is no inversion of the foot. When seen in 1875 her condition was unchanged, except that her walk had been much improved by the use of a boot with an inch of thickness added to its sole.

Emily W., who is now (when seen at the Hospital for Sick Children in 1875) five, was found, when she began to walk at the age of sixteen months, to have some defect at her right hip joint which made her somewhat lame, but there was no pain in the limb, and till then nothing abnormal had been suspected. The same condition has remained. She is still lame, walking "on her toe;" the limb is small and weak, and an inch and a half shorter than the left. There is no rotation of the femur, the position of the foot being natural in this respect. There is slight lordosis. The trochanter is placed vertically above the usual position of the acetabulum, and nearly level with the anterior iliac spine. The head and all but the base of the neck of the femur seem to be absent, so that the upper end is stump-like. This is fixed in a false joint to the pelvis, and does not slide. All the movements natural to a hip joint are free, except that abduction is slightly limited. The child has never complained of pain in the limb, which she uses very freely. The lameness was much relieved by the use of a high boot.

It is well to remember that not only may the clinical features of these cases be but faintly marked,



owing to the fact that the anatomical defect is, as in the instance last related, comparatively slight, but further, that as the result of anatomical variations on the two sides the symptoms may be so far modified as to throw the true nature of the patient's condition into obscurity until it has been fully investigated. This was well shown in a case lately under the care of Mr. Morgan, in the Hospital for Sick Children, and which I have his leave to quote. A girl, aged nine, seen in 1882, had congenital dislocation of both hips. In walking or running there was very little roll of the trunk from side to side; but she moved with difficulty, as if she was suffering from muscular rigidity of the limbs often seen after affections of the spinal cord; and she was much more lame on the left than on the right leg. The two limbs were unsymmetrical, the left knee being maintained in a posture of slight flexion, while the right easily became extended. She walked on the toe of the left foot, and very insecurely; while the right heel came fairly to the ground. There was very little lordosis. When she was lying on her back the right limb could be fully extended and abducted to a considerable extent on the trunk; but the left could not be extended, while abduction was very limited. Few, I think, would have guessed the true explanation of these symptoms, and it was only when the hips were carefully examined that it was found that, on the left side, the small and irregular head of the femur was so loosely connected with the dorsum ilii just in front of the sacro-sciatic foramen that it could slide to the extent of about three-quarters of an inch; and that on the right side the head was enclosed in a false joint above and a little behind the normal site of the acetabulum.

The origin of congenital dislocation of the hip is still involved in considerable uncertainty. Three main theories have been advanced to explain its



occurrence. 1. That it is due to an original defect of development. 2. That it is the result of disease, and is produced by spasmodic contraction, or, according to some, by paralysis of the muscles about the joint, by relaxation of the ligaments, or by hydrarthrosis. 3. That it is traumatic, and is caused either by some injury of the fœtus in utero, or by force used to facilitate birth in a difficult labour. As to the various causes specified under the second heading, they are not only wanting in proof, but appear to be inconsistent with what can be positively ascertained. The muscles in these cases show no trace of spasmodic contraction, and certainly they are not the seat of paralysis; nor is it easy to see how paralysis should produce dislocation; while the view that the displacement is due to muscular spasm has probably arisen out of the now exploded doctrine that the various forms of congenital talipes are thus brought about. As to relaxation of the ligaments and hydrarthrosis, they appear wholly hypothetical, mere speculations indulged in apart from pathological observation.

The opinion that some of the cases are traumatic is supported by trustworthy evidence. I am not aware of any instance in which the condition has been proved to have been due to injury in utero; but examples have been reported in which it was produced in breech presentations by traction on the angle between the trunk and the thigh, either with the finger or a blunt hook. The following seems a clear example. Some years ago I saw a little girl, aged about four, with congenital dislocation of the right hip; and a surgeon, practising at Islington, but now deceased, told me that he attended the mother at the birth of the child, that there was a breech presentation, and that while he was endeavouring to effect delivery by using a blunt hook as above described, he distinctly felt the head of the femur slip out of the acetabulum.

He added that he had always blamed himself for not having taken means at the time to reduce the displacement. Though such accidents are probably rare, and although some may even doubt their existence, the possibility of their occurrence should be borne in mind when force is being used in the manner related.

I have met with two instances in which a fall in early infancy may perhaps have led to injury, the effects of which simulated congenital dislocation. One may be briefly noticed. John W., when four months old, fell to the ground through a distance of about four feet, striking his face and head, and injuring his right thigh so that a day or two later a considerable ecchymosis appeared around the joint. The pain that followed was not severe, and only lasted a few days. The injury was forgotten till four months later, when he began to use his limbs in attempts at walking. It was then found that he could not bring his foot to the ground. On examination, when he was nine years old, I found the great trochanter flattened, and drawn up so as to be very nearly level with the anterior iliac spine, and situated between that process and the acetabulum. It may here be mentioned, in passing, that, after acute arthritis occurring in an infant of a few weeks old (*see* "Acute arthritis of infants," page 454), the hip joint may be left completely disorganised, so that, subsequently, should the patient survive, the condition of the hip so closely resembles congenital dislocation that it is usually mistaken for it.

While, therefore, some cases may be the result of injury, and while some instances that usually pass for congenital dislocation really belong to an entirely different group, we must look for some further explanation of the following circumstances. That congenital dislocation is probably five times more common in females than in males; that it is frequently double; that there is often no history of injury of the fœtus in

utero, that birth was perfectly normal, and that no force was used ; that the position of the false joint is frequently above, or in front of, rather than behind the normal position of the acetabulum, and that the deformity is occasionally hereditary, as it clearly was in the case of M. B. (case above related).\*

Although there is, I think, no dissected specimen of a foetus, or of an infant immediately after birth (before consecutive changes have occurred to mask the original condition), to prove it, the strong probability is that the affection is due to an arrest of development, so that sometimes the acetabulum is defective and shallow, while in other cases, although there is a ball-and-socket joint, this is both rudimentary, and faulty in position. However, as I said above, the subject is obscure, and one that it is needless to discuss here at any greater length. Whatever may be the cause or causes of this affection, it is necessary to remember that it is far from uncommon. Dupuytren had seen twenty-six cases ; Mr. W. Adams reports thirty-eight ; while in the last twenty years, at St. Bartholomew's Hospital, the Hospital for Sick Children, or the Alexandra Hospital for Hip Disease, and elsewhere, I have met with upwards of eighty examples, many of which, however, have been under the care of other surgeons. In a considerable number of these cases, especially of the slighter forms, the condition had been overlooked, or mistaken for some other affection. In one instance the patient, a girl of nine, had been treated for seven months for double hip disease, by splints, and a succession of flying blisters.

*Diagnosis.*—No one who has met with one of these

\* It will be remembered that many authors have asserted that congenital dislocation of the hip is sometimes hereditary, but the statement seems to rest mainly on the authority of Dupuytren, who quotes from Maissiat the history of a family in Mantua, many members of which, in different generations, are reported to have suffered from this defect.



cases, or who will bear the following points in view, is likely to fall into error. (a) The defect is much more common (in the proportion, as already stated, of at least five to one) in females than in males. (b) Though often affecting both sides, it is by no means rarely confined to one, and it is the unilateral cases that are most likely to be overlooked. (c) The history is very similar in all the cases, and is to the effect that the parents knew nothing of the defect till the child, on learning to walk at the age of eighteen months or two years (these children almost invariably are late in getting on their feet), was found to be lame, or to roll from side to side, and to be so unsteady that it often fell. (d) There is usually no reliable account of any injury, and the child has complained of no pain, and though easily fatigued, has always shown an inclination to run about as much as others of the same age. (e) Though in the worst cases, such as Dupuytren described, the limbs are adducted and inverted, and the patient walks on the toes, in the much more common and less severe examples the position of the limbs is natural, and the heel easily comes to the ground. (f) The limbs are usually somewhat small and thin, and deficient in muscular development. When only one side is involved, the limb, in comparison with its fellow, often looks wasted, as if the seat of a minor degree of infantile paralysis, and there is frequently an inch or more of shortening. (g) Movement in every direction is usually perfectly free, except that abduction is somewhat limited. (h) Lordosis, though most authors speak of it as always present, varies considerably, and is sometimes entirely absent. Both it, and the associated protrusion of the abdomen, and throwing back of the shoulders, depend on the relation of the heads of the thigh bones to the sides of the pelvis. When the thigh bones are free to slide, so that, as the patient stands, an aggravated form



of dislocation upwards and backwards occurs, or when the false joint is placed behind the normal site of the acetabulum, the line of gravity is thrown forward, the pelvis becomes rotated on its transverse axis, and lordosis is proportionately developed. But when the false joint is situated above, or above and in front of the natural position of the acetabulum, the line of gravity is not displaced, and therefore no lordosis and no throwing back of the shoulders are produced. All these particulars should be carefully noted; but the crucial test is, (*i*) that in combination with them there is displacement of the trochanter.

Sometimes the trochanter is freely movable, so as to slide about, perhaps with a sensation of grating when the femur is manipulated, to the extent, it may be, of an inch and a half or two inches, even in a child; or this sliding may be very limited, and is detected only when the shaft is pushed, in the flexed position, directly backwards. Sometimes there is no sliding, but the trochanter lies distinctly, often considerably, above Nélaton's line, in a position either above and behind, above, or above and in front of the normal site of the acetabulum. This altered relation of the trochanter to Nélaton's line is invariably present. But two points must be borne in mind. First, that the defect is sometimes so slight, and the trochanter is so little displaced, that the real condition of things may easily be overlooked; and secondly, that in rickety curvature of the femur the neck of the bone may form a right angle with the shaft, with the result that the trochanter lies considerably above Nélaton's line. It is, therefore, here, as in so many other instances, necessary to look well to all the points of the case, and to consider negative as well as positive evidence. If the child has been lame ever since he first learned to walk, if there is no sign of any other affection accounting for the symptoms observed, if the gait is peculiar, and if the

patient has never complained of pain, even if a slight fault in the position of the trochanter is combined with limitation of abduction, and with lordosis, and especially if the opposite hip is normal, the case may be regarded as one of congenital dislocation; while if, although the trochanter lies, on both sides, distinctly above Nélaton's line, if the history shows that the deformity, absent at first, has been slowly increasing, if the child is rickety, if other bones are curved, and if the muscular system is weak, it may be concluded that the state of the hip, and the waddling and unsteady manner in which the patient walks, are due to rickets. The conditions for which congenital dislocation is apt to be mistaken are hip disease, the disorganised and "loose" joint left after acute arthritis in infants (page 130), infantile paralysis, and rickets in the form above alluded to. The symptoms of hip disease, which are widely different from those of congenital dislocation, are fully noted at page 384 *et seq.* The condition of the joint after acute arthritis is related at page 130.

*Treatment.*—In the slighter cases, in which only one side is affected, and there are no sliding of the upper end of the femur and only moderate shortening of the limb, progression is much improved by a lightly built high boot. But when the femur is free to slide, and the muscular development of the limb is defective, a high boot will often be useless, or even a source of embarrassment, in consequence of the unsteadiness and diminished power of the limb. A variety of appliances, of the nature of pelvic belts, have been contrived, both for single and double cases, but it must be confessed they have often proved of no service in restricting the sliding of the bones on each other, and so decreasing the labour of walking. Prolonged confinement of the patient to the horizontal position, combined with weight extension, as employed

in hip disease, has been recommended, and in some cases appears to have been permanently beneficial. I am not aware that such an operation has been performed, but it would seem justifiable to expose the parts, when the thigh bones slide widely on the side of the pelvis, and the limbs are adducted and inverted (*see* Fig. 35) to denude the head of the femur, and either the floor of the acetabulum, if this cavity be present, or an equivalent surface on the pelvic wall, and to fasten the capsule closely around the upper end of the femur. If the limb were then fixed on a Thomas's splint (Fig. 59), bony or fibrous ankylosis might probably be obtained.\* In many instances, as the patient grows up and muscular strength increases, the power of walking and running steadily improves. Much, in the less severe cases, may also be gained in childhood by having the patient carefully trained and drilled.

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## CHAPTER XIX.

### ON THE PREJUDICIAL EFFECTS OF INTRA-ARTICULAR PRESSURE; AND ON THE DANGER OF PRODUCING IT BY SURGICAL APPLIANCES.

ALL will accept the general proposition that rest is essential in the treatment of inflammatory diseases of the joints. Yet there are some points which require

\* Since writing the above, I have met with a paper by Dr. Heusner (Langenbeck's Archiv., Bd. xxxi. Heft 3), relating a case in which he removed the head of the femur, scraped the acetabulum, and placed the end of the femur in the cavity. In eight weeks the patient could stand on the limb, and was apparently much improved.



to be insisted upon, in order that the principle may be adequately carried out. The first relates to reflex contraction of the surrounding muscles. This condition is present in all cases. In the majority, however, it is only slight, and sufficient merely to secure more or less fixation and protection of the affected joint. Neither in the shoulder, the elbow, the wrist, nor the ankle does it become excessive, so as to lead either to deformity or excessive pain. All these joints when first attacked are placed in their respective positions of greatest ease, and these positions are maintained undisturbed by muscular spasm through even long periods of active disease. In disease of the shoulder the arm remains at the side: the elbow is kept at an angle of about  $120^{\circ}$ , the wrist is slightly dropped, the ankle is fixed in a position of slight equinus. Both the hip and the knee, however, offer a strong contrast to all these instances. They are liable to the influence of constant, and often violent, spasm in the surrounding muscles, which frequently leads to severe suffering and to irremediable deformity. Little can, I think, be said in explanation of this tendency to excessive contraction in the muscles lying round the hip and the knee, but it is one of the main elements which have to be dealt with in the treatment of these two joints, and one which, as I shall subsequently endeavour to show, asserts its influence in several different ways.

To secure rest for a diseased joint all its component structures must be taken into account, and the different sources of disturbance must be kept in view. The synovial membrane must not only be defended from mechanical disturbance by movements of the joint which would have the effect of dragging upon or compressing its swollen processes and fringes, it must also be relieved, as far as possible, of its function of secreting synovia; while if it has become



distended by effusion, appropriate means must be taken to remove this condition. The articular ends of the bones must in the same way be relieved of their ordinary functions of sustaining the pressure to which they are exposed, not only when they are engaged in transmitting the weight of the body, but also during muscular action. The latter form of pressure is, of course, well known to every anatomist and every surgeon. The tibia, in the case of the knee, for example, is a lever acted on by the surrounding muscles, and having the condyles of the thigh bone as its fulcrum; and whenever the muscles contract, so as to move the tibia, its upper end is pressed against the femur. Hence, to place the knee joint at rest, it is necessary not only to protect the synovial membrane from disturbance, and to relieve it from the active discharge of its secretory functions, and to prevent the patient from bearing weight on the limb, but also to remove intra-articular pressure resulting from muscular contraction.

Rest both from the weight of the body, and from the pressure attending muscular action, is secured for a healthy knee joint for a considerable period in every twenty-four hours. During sleep, and under many other circumstances, all weight is removed; the limb is placed in the semiflexed position, so that the articular surfaces are in contact to only a very limited extent; all the ligaments and all the surrounding muscles are relaxed, and the bones touch without pressing upon each other.

The conditions, however, under which a diseased joint is placed are widely different. Pressure depending on superincumbent weight may, it is true, be removed by posture. But, in consequence of reflex irritation, the muscles are kept in a state of contraction, which in the hip and knee is often so spasmodic and so violent that it is attended with extremely

painful jumpings and startings of the whole limb. The force with which the muscles act exceeds normal contraction as pain exceeds natural sensation. Its amount is indicated by the suffering it causes when, as is so often the case, the slightest movement of the limb, or a light step across the floor, or even in an adjoining room, brings on a succession of spasms which make the patient cry out with pain, while such violent contractions occur the moment he dozes off, or even composes himself to sleep, that though he has passed through hours of distress his chief anxiety is to keep himself awake. Under these circumstances the articular ends of the bones are not only deprived of the usual respite from pressure which constitutes their physiological rest; but, diseased as they are, and, therefore, so much the more in need of rest, they are exposed hour after hour, or even week after week, to an amount of pressure which, in consequence of the power and suddenness with which the muscles act, is in many cases greatly in excess of that to which they would be exposed, except on very rare occasions, in the condition of health.

Any scheme for treating the hip or the knee, therefore, must include a provision for the relief of intra-articular pressure. There are at present two principal methods by which this may be attempted: (1) The joint may be placed in some form of rigid apparatus which prevents movement, and under the influence of which muscular spasms will gradually subside. In all the joints except the hip and knee, and in many instances in these also, this method is efficient, and leaves nothing to be desired. Improvement is immediate, and the subsequent progress of the patient is in the majority of the cases satisfactory (page 414). (2) Weight extension may be employed. It is not too much to say that the introduction of extension by means of the weight and pulley has effected a

revolution in the treatment of many forms of diseases of hip and knee. Instances are constantly to be met with in which, by the help of this method, patients previously in severe suffering, and presenting such marked symptoms as night startings, high temperature, and wasting are at once relieved, and soon rapidly improve. This fact is so well known at the present day that it is scarcely necessary to confirm it by cases. Yet the contrast between the two following instances may be taken as an illustration of it.

*Case 1.*—Sir Benjamin Brodie\* relates the case of a gentleman who had hip disease, resulting from a fall from his horse.

“One morning after the application of leeches he had a paroxysm of violent pain, attended with spasmodic action of the muscles of the thigh. The pain during this attack was so excruciating that, to use his own expression, he wished for immediate death. He took no less than one hundred and fifty drops of laudanum before he obtained relief. From this time, however, he was never wholly free from pain, and he was also liable to repeated attacks of more intense suffering, attended with violent spasms of the muscles of the thigh.” He died a few months later (after suppuration had occurred) of phthisis. Brodie believes that the spasmodic condition of the muscles depended on the formation of matter deep in the thigh, causing pressure on the branches of the anterior crural and the obturator nerves, which he found were in close relation to the sac of the abscess. But, however produced, this condition would, there must be no doubt, have been restrained had the muscles been controlled by the continuous application of a sufficiently heavy weight to the limb.

*Case 2.*—I lately attended a patient, aged twenty-three, whose right hip joint was diseased after an

\* “*Diseases of the Joints*,” p. 121. 5th ed., 1850.



injury in hunting. When first seen, he was suffering so severely with spasmodic action of the muscles of the thigh that he was afraid to go to sleep. His temperature was  $102^{\circ}$ , sometimes  $104^{\circ}$ ; he had profuse sweating, and was wasting quickly. A weight of seven pounds, increased in two days to fourteen pounds, very soon relieved him, and in the course of a week the spasms became very slight, and occurred not more than once or twice during the night. They subsequently ceased to trouble him, and though a large abscess formed in the thigh, and discharged so profusely that at one period the question of amputation at the hip joint was raised, he had no more severe pain, and ultimately recovered with ankylosis. The efficacy of the weight in relieving spasm in this case was also shown by the fact that if it was removed, even for a moment, painful muscular contractions immediately returned; while on one occasion, when the weight became accidentally detached during the night, the patient suffered severely for nearly twelve hours, though the extension was re-applied with the shortest possible delay.

Indeed, the experience of every day shows that, setting aside that which depends on the formation of abscess, which, however, is often very slight, the severe suffering attending disease of the hip and the knee joints is due almost entirely to intra-articular pressure from muscular spasm. When I was house surgeon in 1862 at the Hospital for Sick Children I often made the following observation: children who on admission presented marked signs of hip disease, including startings of the limb, and frequent night screams, were placed in bed with no other treatment than weight extension. In almost every instance the acute symptoms at once subsided. When the children had become free from pain, which was usually the case within two or three days, I removed the weight



while they were asleep, and found that they became restless, and soon awoke. They, however, fell asleep again when the weight was replaced.

Yet there lies at the bottom of the successful application of weight extension a principle which is frequently overlooked, and the result is that, instead of acting so as to relieve intra-articular pressure, by drawing the surfaces out of abnormally close contact, extension has exactly the opposite effect, for it brings

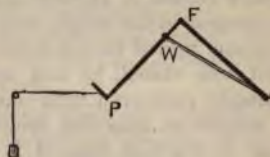


Fig. 36.—Weight Extension acting as Leverage in the Case of the Knee.

P, Pulley; W, weight; F, fulcrum.

the articular ends still more firmly together. If the weight is attached to a limb that is in a position of extension (to the leg, for instance, when the knee can be straightened), its tendency is to draw the joint surface apart.\* In the majority of cases, however,

\* It is often said that the surfaces of a healthy joint do not admit of separation. The degree to which separation is possible is, no doubt, very slight, and no more than is sufficient to permit of free movement. If, however, traction is made on one of the fingers when it is extended on the hand, it will be seen that the first phalanx can be distinctly drawn away from the head of the metacarpal bone, so that the capsule is pressed into the interval by the weight of the surrounding atmosphere. It will also be found that the phalanx can be thrust back into contact with the metacarpal bone with a concussion that can be plainly felt, and often plainly heard. The wrist also, in most people, can be so far "drawn out" that the bones return with a very appreciable stroke. But the effect of the weight is not so much to draw the surfaces apart, so that there is an interval between them, as by removing muscular spasm to prevent their being pressed too firmly together, and constantly maintained in that abnormal condition.

in which the weight is used, the joint is fixed in a posture of flexion, and does not admit of extension. Now, if the weight is applied in the usual manner, when the limb is flexed, it will be seen by looking at Fig. 36 that the force called into play is really that of leverage of the second order. The traction weight attached to the foot is the power acting on the

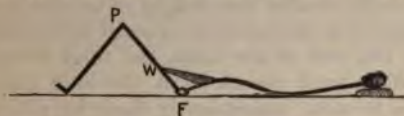


Fig. 37.—Posture of the Limb in Hip Disease in which Weight Extension acts as Leverage.

*p*, Pulley; *w*, weight; *f*, fulcrum.

lever formed by the tibia, the resistance to be overcome is in the contraction of the hamstring muscles (inserted just below the head of the bone), and the ligamentous structures at the back of the joint; the

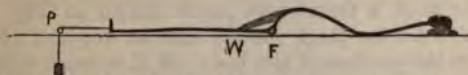


Fig. 38.—Weight Extension acting as Leverage in Hip Disease.

*p*, Pulley; *w*, weight; *f*, fulcrum.

fulcrum is constituted by the condyles of the femur. The effect of the traction weight is, therefore, to bring the head of the tibia into firm contact with the condyles of the femur. In the same way in the case of the hip joint (*see* Fig. 37), the weight attached to the foot acts on the femur as the power tending to overcome the resistance offered to extension of the thigh on the trunk, by the rigid psoas and iliacus, inserted into the lesser trochanter.

If the parts are examined when the weight has been applied it will be found that the limb has come

down into the horizontal position, while the pelvis has been rotated so as to produce curvature of the lumbar spine forward, as in Fig. 38. This change in the position of the limb, however, does not alter the force that is being employed. The force is leverage still, and intra-articular pressure is still in action. In order to prevent this effect of the weight, in other words, to secure that it shall act by extension instead of by leverage, it is necessary to proceed in the following way. In the case of the knee, the thigh being fixed, the extension must be made in the long axis of the leg. This is most conveniently done by placing the

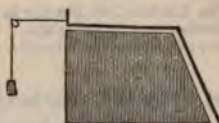


Fig. 39.—Position of the Limb during Extension for Disease of the Knee Joint.

limb on such a framework as is shown in Fig. 39. The plane for the thigh should form an angle of about  $60^\circ$  with the surface of the bed. If it is more oblique the leg will, if there is much flexion, approach the perpendicular, a position not only inconvenient but likely to induce œdema of the foot. In order to fix the thigh so that it is not drawn down, counter-extension may be secured on the following plan, suggested by Mr. E. J. Lewis, house surgeon at the Hospital for Sick Children. A trough-like and well-padded splint of leather or poro-plastic felt is adapted to the back of the thigh. To this a loop is fixed, with which is connected a cord running to the head of the bed, and there turning over a pulley and supporting a weight of four or five pounds (Fig. 40). I have found this a very serviceable method; but care must be taken that no undue pressure is made on the back of the thigh.

On the same principle, when the hip is the affected joint, the leg being extended on the thigh, the limb must be raised till the spine is free from anterior curvature, and must then be supported in this position (Figs. 55, 56); the weight being made to act in the long axis of the limb. Then, as the weight gradually reduces the angle of flexion at the joint, the apparatus must be re-arranged by reducing the height to which the limb is raised, and



Fig. 40.—Extension and Counter-Extension in Disease of the Knee Joint.

by changing the position of the pulley so that traction is still maintained in the long axis of the limb. By following out this process the limb will be gradually brought down into complete extension. (*See page 400.*)

It seems advisable to draw particular attention to this subject. Here is a great principle of treatment to which every one freely subscribes; the principle, namely, of removing intra-articular pressure. Yet there can be no doubt that, though we possess adequate means for carrying this principle into effect, there is some danger that the method may be used in such a manner as to produce just the opposite result. I have seen many cases in which weight extension, applied as in Fig. 37, has had the effect of increasing pain,



and has therefore been discarded as an unsuitable method of treatment. In these cases, however, when the limb has been arranged, as in Fig. 55 (page 397), and the weight has been replaced, pain has been at once relieved and the efficacy of the treatment has been fully vindicated.

But weight extension is not the only method at present in use by which intra-articular pressure may be inadvertently produced. Take next the case in which a joint is straightened under chloroform.\* In this proceeding, the knee being taken as a convenient illustration, the tibia is used as a lever to overcome the resistance offered by the contracted hamstring muscles and the various ligamentous structures about the joint, and the head of the bone is made to bear forcibly against the condyles of the femur.†

This operation, as all who have performed it are aware, often produces considerable pain, and not rarely a good deal of subsequent heat and swelling, symptoms in part, no doubt, due to disturbance of the soft structures of the joint, and to the rupture of adhesions, but also often in great part to the injury which the articular ends of the bones have inflicted on each other in the relation of lever and fulcrum which they have been respectively made to bear. Nor is the mischief at an end when the straightening itself

\* As surgery improves forcible movement is being employed with greater discrimination than formerly. It is rapidly falling into disuse for the straightening of joints that are or have been seriously diseased (page 234).

† It will be observed that, while the muscles surrounding the knee and other joints almost all act on levers of the third order, it is the second form that is used when we resort to forcible straightening. It will be observed, also, that while the muscles act at a great disadvantage as to power, owing to the fact that they are inserted so near the centre of motion that leverage is very short, in forcible straightening the leverage employed is much more powerful, for the lever is formed by one of the long bones grasped at its farther end.

is completed; but pressure is maintained when the limb is placed upon a splint, with the recently extended muscles and ligaments still in a tense and resisting condition. This continuance of pressure is shown by the pain which persists, in some instances for many days or even for some weeks after the operation.

Another case in which intra-articular pressure is produced in the treatment of joint diseases is the general one in which any kind of apparatus, working by a screw, is used for straightening a contracted limb. The best example that can be given of a large number of appliances of this kind is the common back splint, working with a screw, however arranged, for extending the knee joint. In this apparatus the leg piece, as it is made to straighten itself on the thigh piece, plays the part exactly of the surgeon's hand when he grasps the tibia and forcibly extends it. In both cases alike the tibia is a lever resting against the condyles of the femur as its fulcrum, and the resistance lies in the contracted hamstrings; while, in the one case, the force is applied by the hand of the operator, in the other it is applied by the screw tending to carry the tibia towards an extended position. Instruments acting on the same principle of leverage, and intended for the treatment of deformities, both of the hip and the knee joints, are to be found in every illustrated work on orthopædic surgery and in every catalogue of surgical appliances. Many of them are very powerful, and are described as competent to overcome any resistance short of that due to bony ankylosis. I will not deny their power. I am sure, however, they often do very great harm. For contraction of the elbow, also, similar appliances are in use. They consist of an arm piece and a fore-arm piece moving on each other at the elbow, under the action of a screw.

Probably all who have employed it have been impressed by the unsatisfactory effect produced, in cases of disease of the knee, by the kind of splint I have alluded to. The contrast between the results of using this kind of appliance, which creates, and the results of weight extension, which removes, intra-articular pressure, was well shown in the two following cases. A woman, aged twenty-seven, was in St. Bartholomew's Hospital for the treatment of acute inflammation of the knee joint of six weeks' duration, following confinement. As the joint was bent within a right angle, a back splint was applied for the purpose of fixing it and keeping it at rest, and every day the screw was slightly turned in order to straighten the leg upon the thigh. This treatment, however, not only failed to relieve the pain of which the patient complained, but had the effect, especially when the screw was turned, of increasing it to such an extent that she begged to have the splint removed. She was, in fact, quite unable to sleep on account of nearly incessant and violent jumpings of the limb, which came on as soon as she dozed off; her temperature was  $103^{\circ}$ , and she was losing flesh so rapidly that it seemed likely amputation would soon be called for. The limb was now placed in the position shown in Fig. 39, and a weight of seven pounds was applied. The result was almost magical. The pain and startings were at once almost entirely removed; her temperature went down to  $100^{\circ}$ ; during the following night she slept for several hours without waking, and said next morning this was the best night she had had since her knee was attacked; her appetite and strength returned, and within a week the joint had ceased to pain her, and was steadily passing into a position of extension. She left the hospital two months later with the limb straight and enclosed in leather splints.

A boy, aged nine, was in the Hospital for Sick



Children in 1884 with a contracted and painful knee. The joint was hot and swollen, the skin over it was tense and shining, the leg was at less than a right angle with the thigh. The limb was placed on an iron back splint fixed at a corresponding angle, and working with an extension screw. This appliance failed to give relief. On the contrary, at the end of a fortnight the pain and heat of the joint were increased, and the boy always complained more after the extension screw had been turned. The limb was now placed as in Fig. 39. The effect was, as in the other case, very striking; the boy was at once much easier, and he slept well. Within a fortnight pain had entirely ceased, the limb was approaching complete extension, and heat and swelling were both subsiding. In six weeks he went to the convalescent branch of the hospital, free from pain, and with the limb enclosed in splints, in a position of nearly complete extension.

It may be objected that in many cases the results I have mentioned of the use of splints for extending joints are not observed; that the limb comes down readily and by a painless process. This is, no doubt, true. Such examples are instances of synovial disease generally slight, and not of long standing, in which the articular ends of the bones are normal, and can bear the pressure which the apparatus involves. The pressure, nevertheless, exists, and in the majority of cases is certainly prejudicial.

This intra-articular pressure is mischievous, not only in its immediate effect on the ends of the bones, but because, by giving rise to reflex irritation, it tends to maintain and to aggravate spasm in the surrounding muscles. Indeed, these two conditions of intra-articular pressure and muscular spasm act and react on each other, and so concur to promote the advance of the disease. The method of weight extension acts in a



radically different manner. It has a direct tendency to fulfil the two main indications of treatment. It tends to separate the articular ends, and by its constant and steady action it tires out the muscles so that they soon sink into a condition of repose.

The numerous class of appliances for straightening contracted joints upon the principle of leverage are open to a further objection. The knee will again serve as the best illustration. When the knee is being acted upon by the ordinary back splint working with a screw, the head of the tibia, by pressing firmly against the femur, tends to induce reflex spasm, so that the hamstring muscles are maintained in a condition of contraction. Under these circumstances they resist the extension of the leg, with the result that instead of the tibia resting upon the condyles of the femur as the end of a lever should, with a firm bite, upon its fulcrum, it tends to slide upon their rounded, polished, and lubricated surface, in a direction backwards into the popliteal space. In other words, instead of the fixed point being at the joint where the tibia rests against the femur, this fixed point is placed where the hamstrings are inserted; so that the result of the use of the splint is not to produce extension but dislocation of the bones of the leg backwards. The effect is very similar in the hip. In cases of contracted hip the appliance generally used consists of a steel pelvic circlet, and a strong bar working with a screw, and reaching down to the knee. The essential part of this instrument is the thigh piece, which is made to travel towards extension by the action of the screw opposite the hip joint. In this movement it makes a lever of the femur, whose fulcrum is at the acetabulum, so that the head of the femur is pressed firmly against the upper and posterior border of *that cavity*. Now, in cases in which the upper

border of the acetabulum and the head of the femur have not undergone absorption, there will be no sliding ; but if absorption has already taken place so that the acetabulum has become shallow, and the head of the femur has melted away, the result of the use of this instrument will very likely be the displacement of the femur upwards and backwards upon the dorsum ilii. An instrument acting on so defective a principle had better not be used. Much better results will be obtained by weight extension employed in the manner described at page 399 *et seq.*

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## CHAPTER XX.

### NERVOUS MIMICRY AND HYSTERIA.

It is to be regretted that it is still necessary to employ the term "hysteria," either in general surgery or in its narrower application to diseases of the joints. It, however, maintains its ground, partly because it has been so long in use that it is difficult to expunge it, and partly because everybody is well aware that it is no longer used in a literal sense, but as a familiar and convenient name for a group of disorders which, in the present state of our knowledge, cannot be placed under any definite heading in pathology. A common, and at the same time main characteristic of so-called hysterical affections, is that they depend on some disturbance of the nervous system, unassociated with any alteration or defect of structure that can be detected. They nevertheless lead to symptoms identical with those which arise when some obvious structural or organic lesion is present. Sir James Paget, who in his "Clinical Lectures and Essays" has drawn

attention to this question, while condemning the use of the word hysteria as absurdly derived, and, being often employed as a term of reproach, worse than absurd, has introduced the term nerve-mimicry, or neuro-mimesis, to indicate those cases in which a nervous disorder produces an imitation or mimicry of organic disease. The various forms of neuro-mimesis of joint diseases that may be met with will best be illustrated by a few typical cases.

*Case 1.*—Annie M., aged fourteen, was brought to the out-patient room of St. Bartholomew's Hospital in 1878, with the left knee so strongly flexed that the heel touched the tuber ischii. Her mother said that fourteen days before the child had fallen down upon her knee, and that a contraction had come on a few days afterwards. A bruise was still visible over the prominent part of the internal condyle. On examination of the joint I could find neither swelling; heat, nor tenderness; in fact, the joint looked perfectly normal. Regarding the contraction as of mere nervous origin, I pretended to search for and find a particular spot in the popliteal space, and, pressing my finger strongly in, peremptorily ordered the patient to straighten the limb. She did so at once, and while the finger was still pressed upon the surface she walked round the room. The contraction never returned.

*Case 2.*—A girl, aged ten, was admitted into the Children's Hospital in the early part of the present year for the treatment of hip disease, from which she was said to have been suffering for about six months. On investigating the case I noticed the following points. The limb was drawn up by tilting of the pelvis to the extent of a little more than three inches, and strongly adducted and rotated inwards, so that the great toe rested on the dorsum of the opposite foot. The whole limb was cold and blue. There was no swelling about the hip; the joint appeared to be

stiff, but the patient complained so much of pain on the slightest touch, and threw herself into a contorted posture by arching her spine forwards, and still further twisting her pelvis, that the real condition of the joint could not be made out. When she had been for a few days under observation, it was ascertained that she never complained of pain in the limb at night, and only when an attempt was made to alter its position; that the position of the limb varied very much, and was sometimes found to be very nearly natural; and that she could move herself in bed without pain. She walked apparently with great difficulty but without pain, and kept the foot of the affected limb in a position of marked equino-varus. There was distinct, though not very marked, muscular wasting. When she was under chloroform every trace of deformity at once disappeared, and the movements of the joint were perfect in every direction. This patient slowly recovered under the influence of careful training, and the use of the faradising electric current. The symptoms of real disease that were so strongly imitated in this instance were tenderness of the surface; pain upon movement of the limb, loss of motion in the joint, lameness, slight wasting, and deformity induced by firm contraction of the adductors and other muscles round the articulation. Diagnosis, however, was easily arrived at by observing that although the various symptoms just enumerated are all signs of inflammation of the hip joint, they occurred in a manner that was inconsistent with the view that they depended on real disease. Thus while tenderness was much more acute than it usually is in even severe disease, it was accompanied by neither swelling, heat, nor redness of the surface. While the patient complained of severe pain on the slightest movement of the joint, she was never disturbed at night, either by pain or starting of the limb, symptoms which would certainly not have been absent had the



pain felt on movement really depended on inflammation of the joint. Again, although so much pain was produced by movement of the limb, there seemed to be very little when she attempted to walk. The manner in which she walked, too, was not like anything seen in acute joint disease. The limb was swung in a loose and almost flail-like fashion, as if partly paralysed, totally unlike the gait of a person who is using the limb for the purpose of fixing and protecting an inflamed joint. And, further, the wasting of the limb, though present to a slight degree, was much less marked than it would have been in the course of acute disease of several months' duration. The suspicion of nervous mimicry, excited by the observation of these features of the case, was confirmed when the limb was found to be perfectly movable under chloroform, but to become spasmodically rigid as soon as the effect of the anæsthetic had passed off.

*Case 3.*—Mary B., aged twenty-six, presented herself in December, 1876, at St. Bartholomew's Hospital, for advice about her right elbow. She said that three months before she had sprained the joint while wringing a wet cloth. The same night the elbow had become excessively painful, so tender that she could not bear even the slightest touch upon the surface, and stiff. The stiffness and sensitiveness still remained. On examination I found the joint quite free from both swelling and heat; indeed, the surface was dusky from feeble venous circulation. But whenever it was touched the patient shrank away as if pain was severe. The smallest attempt at movement made her scream, and although great gentleness was used she threw herself into a state of excessive nervous agitation during the examination. When she was under ether the joint passed, with the exercise of scarcely any force, and without any sign of the giving way of adhesions, into a position of full extension, and was found to

with complete freedom in all its natural directions. It, however, at once became stiff when the patient regained consciousness. Three applications of the faradising electric current completely cured this case.

In some instances, instead of muscular spasm, which fixes a joint in one position, a condition of paralysis may be met with, so that the patient has lost all power of moving the joint. A young woman, of whose case, however, I have only imperfect notes, had complete paralysis of the extensors of the wrist, so that the hand hung at a right angle with the fore-arm in the manner observed in the wrist drop of lead palsy. She complained of considerable aching about the joint, and of a burning sensation over the back of the carpus. The hand could easily be brought into a line with the fore-arm, but it immediately dropped when the support was removed. There was, however, no pain, and no other sign of disease. Electrical reaction was normal. This case, like that just related, was cured by a few applications of faradism. The case was a well-marked example of the condition which Sir James Paget speaks of as one of "want of will, amounting to feebleness or complete negation of will in reference to the supposed seat of disease, while towards other things the will is strong enough. A girl who has will enough in other things to rule the house, has yet not will enough in regard to her limbs to walk a step with them, though they are as muscular as ever in her life. She says, as all such patients do, 'I cannot.' It looks like 'I will not,' but it is 'I cannot will.'" \* It will be observed that though the foregoing cases, which are illustrations of a large group, are classified as instances of nervous mimicry affecting joints, they are really examples of nervous disorders of the muscular system, only involving the joints by rendering them rigid or powerless.

\* "Clinical Lectures and Essays," p. 188. 2nd ed.

In a third group the joints are affected by nervous mimicry in the form of intense pain, felt whenever an attempt is made to use them. Patients are sometimes seen who, after a slight blow or a sprain of the hip or knee, complain of such severe pain that they are unable to bear any weight on the limb, or even to place the foot on the ground. On examination, however, the joint is seen to be free from all appearance of disease. There is no swelling, the temperature is normal, and the muscular wasting is very slight, or entirely absent; and when an anæsthetic has been administered movement is completely free and smooth between the articular surfaces. These neuralgic or painful joints are met with most commonly in persons who suffer from cold feet and hands, chilblains, and other signs of feeble circulation, and the joint itself is often cold, and the skin over it dusky from venous congestion.

*Diagnosis.*—A point of considerable importance in the diagnosis of these cases of neuro-mimesis is that, though the limb may be considerably distorted in respect of its mere posture, no real deformity is present, and the natural position, and with it free movement, is at once regained when the patient is under an anæsthetic. Thus, in case 1 muscular spasm had drawn the patient's heel into contact with the tuberosity of the ischium. This position, however, was merely the extreme degree of natural flexion. In case 2 the thigh had become considerably adducted on the pelvis, and then the pelvis had become, for compensation, very much drawn up on the affected side (*see* page 387). The position, however, was a mere posture of the limb, which entirely disappeared under ether. These contractions never produce the form of displacement of the bones which is met with, *e.g.* in disease of the knee as the result of organic disease.

Bearing in mind that the principal symptoms of organic disease of the joints are pain, swelling, stiffness,



and muscular wasting, it may be useful to glance at each of these in its relation to nervous mimicry.

**Pain.**—The main features of the pain that accompanies neuro-mimesis are that it is generally out of all proportion to the other signs of disease, and that it is evidently very largely of mental origin. The surface of the joint is so exquisitely sensitive that the patient will not bear the lightest touch, or even a gentle pinch of the skin, and any attempt to move the joint produces an amount of suffering which, were it due to inflammatory disease, would certainly be associated with heat and night startings, with high temperature and considerable constitutional disturbance. As a matter of fact, however, in these cases the patient looks perfectly well, there is no fever, the general health is quite unaffected, there is no pain to disturb a sound night's rest, and the patient may often be observed to move in bed with a freedom which would be impossible in active joint disease. Moreover, when the mind is diverted the joint bears both firm pressure and some movement, if these tests are not suddenly produced so as to recall attention to the joint, without complaint; and the joint is not only free from abnormal heat, but is often unnaturally cold, and the skin is blue and dusky from deficient circulation.

**Swelling.**—In a large number of instances swelling is entirely absent, so that although the joint is stiff, and the seat of an amount of pain which, were it due to inflammation, would indicate considerable disease, there is obviously no effusion either into the synovial cavity or the soft structures surrounding the articulation. This absence of swelling is a very important diagnostic sign, for whenever inflammation is present in any joint except the shoulder and hip, in which, from their deep situation, it cannot be detected, some swelling is invariably met with. It must, however, on the other hand, be remembered that swelling



is occasionally seen about a joint in cases of mere nervous disorder or nervous mimicry. Such swelling presents itself, not in the form of exudation into the cavity of the articulation, but as an ill-marked puffy effusion into the surrounding areolar tissue, often attended with transient heat or flushing of the surface, and with hyper-æsthesia of the skin. It is, in fact, very similar to the œdema which is not rarely met with in *tic-douloureux*, or in other forms of severe neuralgia. Although swelling of this character may at first sight appear to depend on organic disease, a careful study of other symptoms of the case will disclose its real nature.

**Heat.**—Very important evidence may be derived from the presence or absence of heat. As I have already mentioned, a joint that is the seat of nervous mimicry is not only as a rule free from heat, but is colder than natural, obviously colder than the corresponding joint of the opposite limb, and this defective temperature is clearly accompanied with a weak condition of the circulation, so that the surface feels like a cold hand, clammy and chill; and if pressure is made with the tip of the finger the displaced blood returns so slowly that the whitened patch is only very gradually reddened again. All this is the rule, yet it must be borne in mind that although the case is one of mere nervous mimicry, the joint may present an unnatural amount of heat. This heat may very easily be distinguished from that which depends on organic disease, for it is inconstant and very variable, absent during the greater part of the day, so that the joint is then perfectly cool, and returning only towards evening or at some particular hour of the day; and it is often associated with flushing of the skin and with transient hyper-æsthesia. Sometimes it is noticed that although the joint is usually cool, or even cold, it becomes hot as soon as an attempt is made to use it, or when the

patient's attention is strongly directed to it. In all such cases it is much more important to notice that the joint is generally cool than that it is occasionally over-warm and flushed, for it may be safely concluded that a joint which is often perfectly cool is not the seat of any inflammatory action.

**Stiffness.**—This symptom must be very carefully studied in any case in which nervous mimicry is suspected. It is characterised, in the first place, by the exaggerated degree in which it is often present; for while motion in a joint affected with inflammation is invariably impaired, it is as a rule, at least in the earlier stages, not completely lost, and its defect can be ascertained to be located either in the joint itself or in the muscles immediately surrounding it; while in nervous mimicry it is easy to notice that the joint is stiffened by the firm and, so to say, emotional contraction of all the muscles of the limb. The position, also, in which the joint is found is often very suggestive. When real disease is present the joint is placed in the position of greatest ease (page 259); but in nervous mimicry it is often either rigidly extended or rigidly flexed, or fixed in some other posture which would certainly tend to increase the pain of real disease. In case No. 1 the limb was maintained in a position of strong flexion. In other cases when the knee is affected the limb is maintained in a position of rigid extension, a posture which in itself is enough to exclude the presence of any inflammatory disease. I have notes of one case in which the elbow was thus completely extended, and of another in which, after a slight sprain of the ankle, the foot was held in a position of extreme equinus. Another point in these cases is that the posture in which the limb is held is not constant. In a patient who had mimicry of hip disease the limb was found sometimes apparently shortened, and a few hours later apparently lengthened. In

another, in which the ankle was attacked, the foot assumed at different times almost all the various forms of talipes, being turned sometimes in one position and sometimes in another. These examples verge on the condition of chorea which Sir James Paget and Sir B. Brodie have observed in nervous mimicry. The stiffness which depends on mere nervous disorder not only completely disappears when the patient is under chloroform, but also, to a large extent, during sleep. In the more severe forms, however, this latter is not the case; rigidity remains, though it may be somewhat less marked than when the patient's attention is directed to the limb.

**Wasting.**—Here, again, is a sign that demands very careful consideration. In any case of inflammatory joint disease, except in the most incipient stage, or when the affection is very slightly developed, atrophy is present; while in many cases of neuro-mimesis it is entirely absent. Thus, this symptom is often available for drawing a line between these two conditions. Yet it cannot be always depended upon for this purpose, for there are many instances of mere nerve disorder in which some, and it may be considerable, muscular wasting is present. In any case of doubtful diagnosis, therefore, it will be important to notice whether atrophy has occurred. If, notwithstanding the presence of pain, stiffness, and lameness, there is no wasting, the latter point may be taken as constituting strong presumptive evidence that the affection is only nervous. Especially may this be held if the joint is habitually cold, and if no swelling of the joint is found after careful measurement. If, however, wasting is present, no hasty conclusion that the case is one of organic disease must be formed, but all the other symptoms, as well as the age and general characteristics of the patient, must be taken into account. These last-mentioned points should always be



allowed their full weight ; for nervous mimicry is most commonly met with in female patients, in whom there is often a history or some present evidence of hysteria, neuralgia, or some other form of nervous disorder. It is often seen, also, in young male subjects who lead sedentary lives and are of a highly-strung nervous temperament, and frightened and fanciful about their health. In one instance a surgeon, aged about twenty-six, consulted me with a suspicion that he was developing hip disease after a railway accident. He walked very lamely, and the muscles of the thigh were maintained in a condition of contraction, the limb being in a position of slight flexion and abduction. There was, however, no trace of wasting or swelling, and he had no pain or stiffness at night ; but he complained of intense suffering on even the slightest touch, and would not tolerate the gentlest attempt to move the limb. Suspecting the nature of the case, I had him placed under the influence of ether, and I then found that the joint moved with the most perfect freedom in every direction. As soon, however, as the effect of the anæsthetic passed off, muscular contraction returned. He recovered quickly under change of air and galvanism.

A group of cases, the diagnosis and treatment of which may present considerable difficulty, is formed by instances in which structural joint disease is associated with hysteria or neuro-mimesis. Such a combination is often met with in female patients between twelve and thirty, and sometimes also in males of a similar age. In such cases a mistake in diagnosis may lead to very unfortunate results. Error can only be avoided by bearing in mind that incipient organic disease is apt to be obscured by hysterical symptoms, and by very closely investigating each case, and repeating the examination a few days later, so that a mature conclusion may be formed. Until doubt has been set aside the patient should be treated as if



organic disease were known to be present. The following example came under notice two years ago. A girl, aged nineteen, complained of pain in her knee, and said that she was unable to walk on the limb. On examination the joint presented a natural appearance, except that it was very slightly puffed on either side of the ligamentum patellæ. The limb was fully extended. There was slightly increased heat of the skin over the joint. The patella was freely movable. On the slightest touch of the surface the patient complained of severe pain, and when an attempt was very gently made to ascertain whether the limb could be flexed she became strongly hysterical. It was found that during sleep the knee was often considerably flexed, but that when she was awake it was always extended. When asked to walk on the limb she became agitated and "hysterical," and instead of attempting to bear weight on the leg she scarcely touched the ground with her heel, but threw herself on the other limb with a violent jerk that must, as it seemed, have inflicted pain on the suspected knee, were it really the seat of disease, but this sudden movement did not appear to hurt her. She was pale and anæmic, and her menstruation was irregular and painful. There was no doubt that this patient was strongly hysterical, and at first her symptoms were ascribed to this condition. But on further investigation it was noticed that the muscles of the thigh were wasted and flabby, that there were night-startings of the limb, that the slight enlargement of the joint was due to firm thickening of the synovial membrane, and that when the patient was under the influence of ether, although I could bend the joint without force, some intra-articular adhesions were felt to give way. Moreover, after the bending, although no violence was used, the joint became painful, hot, and swollen. It was, on a review of all these circumstances, believed that though

the patient was plainly hysterical, the condition of the joint depended on organic disease. The limb was therefore placed in leather splints and the patient was advised to keep it at complete rest. On leaving the hospital, however, she, as I afterwards learnt, discarded the splints and got about as well as she could. Six months later I saw her again, and found her suffering from advanced disease of the joint, indicated by considerable swelling, flexion, heat of the surface, and commencing displacement of the tibia backwards and outwards. Two years later the limb was amputated at another hospital.

In this group of cases the danger is, that finding the patient is hysterical, we may overlook the fact that behind this condition organic disease is present. The important point is to make the diagnosis turn, not on the detection of hysteria, but on the question whether the symptoms of organic mischief can be absolutely excluded. In the case just related it was evident that the patient was very hysterical, and the fact that the limb was kept fully extended, the extreme sensitiveness of the skin over the joint, and the way in which she threw herself about when she attempted to walk, all at first sight pointed to mere hysteria. But, on the other hand, the wasting of the muscles, the starting of the limb at night, and the distinct, though slight, swelling of the synovial membrane, formed a combination of symptoms which, though each was slight in itself, raised a strong suspicion of organic disease; and this was converted into a certainty when, during the examination under ether, adhesions were felt to give way, and when afterwards the joint became swollen, hot, and painful.

*Treatment of hysterical joints.*—This must be general and local. General treatment should comprise means for restoring or improving the health. Iron and other tonics must be given if the patient is anæmic, and

irregular menstruation must be corrected according to rules to be found in the standard works on this subject. Plenty of fresh air, and any exercise that can be taken, should be insisted on, though the latter should fall short of fatigue. The patient's mind should be diverted, as far as possible, from her malady, and her attention occupied by pleasant surroundings. She should be assured that there is no serious disease of the joint, and be given to understand that her recovery is certain to take place. I have always observed that the best course is to convey the impression that there can be no kind of doubt on this head. This attitude will strongly encourage a patient who (as many do) really wishes to recover; while in the case of patients who wish to pose as interesting invalids, it affords little upon which they can cultivate their inclinations and morbid fancies. Local treatment consists in the use of warmth, for hysterical joints are usually cold. The part should be covered with flannel, and hot douching morning and evening is often of service. Any abnormal position which the limb may have assumed should be at once corrected, and a splint should be applied to prevent its return. Often an anæsthetic will be required to ensure the necessary muscular relaxation, and plaster of Paris applied in the manner described by Mr. Croft\* forms a convenient retention apparatus. In many cases I have, while the patient has been under the influence of ether, placed the limb in the position opposite to that which it has assumed. This has seemed to have the effect of tiring out the muscles that have been at fault. The joint should not, however, be maintained in a rigid position for more than about a fortnight. After this period it should be shampooed and douched with hot water, and electricity should be regularly applied once or twice a day. In many cases this form of treatment

\* *Lancet*, p. 2; 1878.



has seemed of much greater efficacy than any other that has been used. Many patients improve steadily when they can be induced to practise movement of the joint, with the assistance of a nurse or attendant, who combines passive motion with that which they are themselves able to effect.

In some instances the distorted condition has been due to paralysis of one group of muscles and the unopposed contraction of their antagonists. The treatment must consist in frictions and shampooing, combined with the use of faradic electricity, applied regularly once or twice a day, to the paralysed group, the joint in the meantime being supported on a splint in its normal position.

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## CHAPTER XXI.

### TUMOURS OF JOINTS.

VERY important and often very obscure cases are those in which the question arises whether we have to deal with some inflammatory or other disease of a joint itself or with a new growth. Tumours imitating joint disease occasionally originate in the synovial membrane. As a very general rule, however, they commence in the articular end of one of the bones. Moreover, they most commonly form in that end of the individual bones in which the original growth of the shaft in length mainly takes place. Hence the occasion for diagnosis between tumours and joint disease chiefly, but by no means exclusively, presents itself in the instances of the shoulder, the wrist, and the knee. Tumours near joints (setting aside for the moment exostoses, which will be mentioned presently—p. 291) belong generally to the sarcomatous group;



some are round or spindle-celled, some myeloid in structure, some, however, are entirely cartilaginous, or sarcomatous in which a large admixture of cartilage is present. Most frequent in subjects between fifteen and twenty-five, these growths are of two main varieties: (1) periosteal and (2) endosteal. The periosteal sarcomata are usually composed of spindle cells imbedded in a matrix of fibrous tissue more or less abundant. Their growth is rapid, and they infiltrate the bone on the one hand and the neighbouring soft tissues on the other. As they enlarge they impinge upon and at length come to occupy the cavity of the joint, and lead to the entire destruction and disappearance of the synovial membrane, ligaments, and cartilages, and to displacement of the bones and deformity of the limb. On section they show the usual soft, fleshy, and mottled surface met with in sarcomata. In their growth they may extend into the neighbouring joint, and infiltrate and destroy its constituent parts. The endosteal sarcomata are frequently composed in large part of myeloid or giant cells; but some are spindle-celled. Their growth is less rapid than is that of the periosteal tumours, and frequently they appear encapsuled, though on close examination it is found that this is not really the case. They rarely affect the lymphatic glands, and do not become disseminated. As they increase they expand the bone and cause its gradual absorption, and in this way they may reach and lead to the destruction of the joint.

The likeness of a new growth to joint disease is sometimes so close that great care is required to avoid an error that may lead to disaster. This is the case when the growth is soft and elastic, and when it is seated in the immediate vicinity of, or has even extended to, the synovial membrane, so that both by its position and its consistence it may be mistaken for a mere inflammatory thickening of the latter structure;

and when, moreover, as not rarely happens, the growth, by interfering with the circulation, has led to effusion into the cavity of the joint. Such tumours, which are usually of the subperiosteal variety, generally grow towards the joint in the form of fleshy or spongy, ill-defined or flattened lobes, low-crowned and diffused, and merging imperceptibly into the adjacent soft structures; or of firm nodules closely abutting on the joint. The joint diseases which they may closely resemble are (*a*) synovitis attended with some effusion, but mainly characterised by considerable pulpy thickening, and induration of the synovial membrane, and enlargement of the articular ends of the bones, as is seen in some of the worst forms of strumous and syphilitic disease (page 101); (*b*) certain forms of chronic rheumatism or osteo-arthritis with synovial effusion, and irregular nodular enlargement of the articular ends of the bones. The main points indicating the presence of a new growth are the following: A new growth is irregular, and, as a rule, extends in some directions obviously beyond the confines of the joint; the shaft of the bone, as well as its mere articular border, is distinctly enlarged; the swelling at the part most remote from the joint is often hard, nodular, lobed, or tuberoso; one bone only is affected; movement of the joint within certain limits may be free. Enlargement is usually rapid and continuous, so that in three months the disease has attained considerable size; the lymphatic glands may be enlarged. Pain, heat, effusion, and distension of the cutaneous veins are symptoms on which in respect to diagnosis little dependence should be placed. In new growths pain may be either slight, moderate, or severe; heat of the surface and general rise of temperature may be quite as marked as they are in mere inflammatory joint disease; the cutaneous veins are often enlarged and conspicuous in some forms of synovitis. Some guidance may be derived from

observing whether the patient presents any evidence of the strumous or of the rheumatic diathesis, or is suffering from disease of any other joint; and the history of the case, and of the patient's family, should be inquired into. Should doubt remain, the disease should be very closely watched, careful measurements should be taken, and the case should be treated as if the affection were inflammatory, with rest and well-fitting splints, or with such remedies as the features of each particular case may suggest. It may even be advisable, due care against septic infection being taken, to remove a portion of the disease for microscopic examination, so that diagnosis may be completed and the appropriate treatment entered upon without delay.

*Treatment.*—The treatment of tumours of the articular ends of the long bones involving the joints must lie between amputation of the limb and enucleation of the growth; or in the case of the upper end of the humerus, or the lower extremity of the ulna or radius, excision of the end of the bone.

Enucleation should be practised when the tumour is cartilaginous and limited in extent, and in some cases of sarcoma when the growth is endosteal and still small and circumscribed, when it has not yet infiltrated the soft structures or involved the joint,\* and when the lymphatics are healthy. In instances of rapidly growing sarcomata, in which the tumour is already large and the lymphatics are affected, amputation should be at once performed. In doubtful cases an exploratory incision should be made before amputation is carried out, or it may even be right, in the first place, to see if the tumour can be satisfactorily removed. Should the attempt fail, amputation must immediately be resorted to. Excision of the end of

\* On the subject of the removal of tumours from bone, the reader should consult a paper by Sir James Paget, *Med. Chir. Trans.*, vol. liv. p. 253.



the bone may be attended with an excellent result in the case of the upper end of the humerus or the lower ends of the bones of the fore-arm. In the course of the year 1886 Mr. Savory, at St. Bartholomew's Hospital, removed the upper third of the humerus for sarcoma growing within it in a girl aged sixteen. The wound healed without drawback, and there was every promise that the limb would be very serviceable when the patient was discharged six weeks after the operation. A case is recorded by Mr. Lucas\* in which he removed the lower half of the ulna for a myeloid tumour growing in it. The patient retained a useful limb. In the same volume (page 138) Mr. Henry Morris has published a valuable paper, in which he relates an instance where he removed the lower two-thirds of the radius and the lower three inches of the ulna for endosteal sarcoma of the lower part of the radius. After recovery the patient could use the limb freely for many purposes when it was supported in a light leather case. In the same communication examples of a somewhat similar operation performed by other surgeons are referred to. Doubtless in the majority of these cases recurrence ultimately takes place, and in some it is not long delayed; yet the interval is in many of them amply sufficient to justify this method of treatment, and the usefulness of the limb is certainly a very striking feature in the result that is often obtained. As to exostoses occurring in the close neighbourhood of the joints, it will be enough to say that not only are they sometimes placed so close to the articular border that their removal may, unless great care is used, be attended with a wound of the synovial membrane, but that they are occasionally invested by a bursa, which communicates directly with the interior of the joint. Even in such cases, however,

\* Clin. Soc. Trans., vol. x. p. 135.



if the fact that the joint has been opened is discovered at the time and careful antiseptic treatment is adopted, no serious result will usually follow. On the other hand, if the necessary precautions are neglected acute arthritis will probably occur, and lead to destruction of the joint.

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## CHAPTER XXII.

### ANCHYLOSIS.

It is very important not to confound ankylosis—that is, the union of articular surfaces by either fibrous tissue or bone—with various other conditions by which the movements of a joint may be interfered with. The two cases are essentially different, and the failure to distinguish between them has often led to serious errors in practice. In the one, the formation of ankylosis involves the destruction of the joint, and the more or less entire obliteration of its cavity. In the other, although stiffness is complete, all the essential structures of the joint may be either intact or but slightly diseased, the obstruction to movement being seated entirely in the surrounding parts. Mere stiffness, imitating ankylosis (and sometimes termed spurious ankylosis), may be due either to (*a*) muscular spasm, of which the best instance perhaps is the rigidity often present in incipient hip disease, and which may be so marked that the femur and pelvis move as one piece. It is also well illustrated at the shoulder. When disease of this joint is quite in its early stage, the joint is often so stiff that any movement of the humerus is at once conveyed to the scapula. Muscular spasm is seen again in

hysterical contractions (page 281), and in some instances it follows sprains and other injuries. (*b*) Stiffness of a joint may depend on the presence of adhesions in the surrounding soft parts, due to inflammation produced by injury, rheumatism, cold, etc. Such adhesions are especially common amongst the muscles surrounding the shoulder joint.

If care be taken, the distinction between ankylosis and mere stiffness depending on conditions external to a joint, can seldom be attended with difficulty. The patient's history is different in the two cases. In instances of ankylosis, there is an account of either very acute or prolonged inflammation of the joint itself. When stiffness depends on conditions external to the joint there is a history either of some accident, of a slight inflammatory attack, or of merely incipient disease. Examination often shows that, though at first sight the joint seemed to be absolutely fixed, this is not really the case, but that some movement remains between the articular surfaces. Thus, in the case of stiffness of the shoulder due to some external cause (though when the humerus is widely moved, the scapula follows it as if the two bones had become one), when the elbow is carried gently through a limited range backwards and forwards, or when the humerus is rotated on its long axis through only two or three degrees, some natural movement, though it may be very limited, is detected at the joint. If the patient is examined under an anæsthetic, any stiffness that is due to muscular spasm will disappear, while, should rigidity depend on adhesions, a very slight amount of force, tentatively applied, will often suffice to rupture some of them, and the nature of the case will become clear, not only from the fact that the adhesions, as they give way, are felt to be outside the joint, but from the immediate restoration of considerable movement. The treatment of

muscular spasm must, of course, depend on the cause. If spasm is a symptom of incipient disease of the joint, treatment must be directed to this condition (page 264 *et seq.*). If it depends on hysteria it is this that must



Fig. 41. — Anchylosis of the Knee Joint, partly fibrous and partly osseous. The tibia has undergone displacement backwards.

be overcome (page 285). The treatment of adhesions external to joints is given at page 223.

We may now turn to ankylosis itself. This may be fibrous, or bony, or, as is often the case, these two forms may be met with in different parts of the same joint (Fig. 41). Fibrous ankylosis varies widely in its extent. In some instances scarcely deserving the name, it is limited to a small patch of adhesions at some part of a joint that has otherwise returned, after inflammation, to a healthy state. In others, the whole cavity has become obliterated by the formation of dense short-



fibred adhesions co-extensive with the original articular surfaces. It is often difficult to estimate the extent to which adhesions have formed. The best guides, as to their amount, are the severity and the duration of the antecedent disease. In cases of acute arthritis of not more than three weeks' or a month's duration, as in some of the more rare examples of rheumatic, or again of urethral arthritis, complete fibrous ankylosis has been met with. In other cases, fibrous ankylosis results from long-continued inflammation of a subacute type. This is common in the usual form of urethral arthritis (page 24), and it is also well illustrated in cases of arthritis occurring in puerperal septicæmia (page 30). Other instances are those in which strumous disease is rapidly followed by the organisation of the inflammatory products into dense fibrous tissue, so that nearly all movement is lost, even when the patient is under an anæsthetic (page 145). It is, however, often impossible to form a true *a priori* estimate as to the extent of adhesions present in a joint. Sometimes they are extensive when inflammation has been comparatively slight; in other cases they are limited, although inflammation has been either very acute, or prolonged. The only reliable course is to make a careful examination when the muscles have been relaxed by giving the patient ether or chloroform.

*Treatment.*—The first step must be to maintain the joint at rest until all inflammatory action has entirely ceased. Neglect of this principle has often led to mischievous results; for forcible movement of a joint, which is still, or has recently been, inflamed, will induce renewed irritation, and further exudation of lymph will occur, and augment the stiffness that is already present. These are among the cases which have brought the manipulation of joints into very undeserved discredit. If rest is maintained



till the joint is quite free from abnormal heat, and till swelling has mainly subsided, or till it is noticed that no further reduction of swelling is taking place, the condition of the joint may safely be investigated. If movement is restored with the use of slight force, and if the adhesions that give way are found to be limited, passive movement may be continued, provided the joint does not become, or at least does not remain, abnormally hot, and is not painful or swollen. In such cases, very good results are obtained. On the other hand, if moderate force does not restore movement, or if, when force is used, extensive intra-articular adhesions are found to be giving way, it is generally useless and inadvisable to proceed further, for to do so is to tear through the cicatrix by which the joint has been replaced, and the only result that can follow such a proceeding is either the re-formation and extension of the cicatrix, or a renewal, in perhaps an active form, of the inflammatory process. In such instances, much as we may regret the conclusion, the best course is to advise the patient to regard a stiff joint as inevitable. This is, I am convinced, the proper course to take in cases in which joints are left stiff after strumous disease. I do not remember ever to have seen movement restored in a joint that was the seat of fibrous ankylosis following struma. Tempting as it may be to use manipulation in these cases, it ought not, I believe, to be resorted to (page 236).

In instances in which a joint has become ankylosed by fibrous adhesions in a position of deformity, it is often advisable, when all disease has come to an end, to use forcible movement for the purpose of placing the limb in a more serviceable posture. Such a proceeding demands great care. It must be conducted with strict regard to the particular circumstances of each joint, and the surgeon will do well to remind himself of the natural extent of different movements

by testing them on the corresponding sound joint. The operation can very seldom be called for in the shoulder, for this joint is unique in the fact that even when the seat of severe or prolonged disease it undergoes no deformity. If, however, force is to be used, the humerus should be rotated on its long axis in the glenoid cavity before any attempt is made to bring the arm away from the side; while the attempt to raise the elbow towards the head must either be entirely avoided, or it must be most cautiously carried out, otherwise the vessels, and the brachial plexus, may be seriously injured. In moving the elbow, the surgeon should always flex before he extends the forearm. Flexion should also always precede extension at the wrist. In the case of the hip, the femur should always be flexed upon the pelvis, abducted, adducted, and rotated on its long axis before it is attempted to extend it. The danger of forcible extension of the hip has reference not so much to injury of the vessels as to the probability that, if the head of the femur, and the border of the acetabulum, have been partially absorbed, the force used may have the effect of dislocating the upper end of the femur upwards and backwards on the *dorsum ilii*. It must also be remembered that the femur constitutes a very powerful lever, and that if violence is used the neck or shaft of the bone may, as has often happened, be fractured. Before attempting to flex the knee joint, it must be ascertained that the patella has not become adherent to the condyles of the femur. If this precaution is neglected, the *ligamentum patella* will be torn across. Extension must be guardedly practised, not only because the popliteal vessels might otherwise be in danger, but because dislocation of the head of the tibia into the popliteal space is very likely to be produced. In the case of the knee, as in that of the hip, division of such of the tendons as are felt to be tense may be required.

But in the instances of both these joints position is usually better corrected by gradual than by immediate force. The ankle may be forcibly flexed without danger, but the tendo Achillis often requires division as an accessory measure. In cases of fibrous ankylosis in which forcible movement has been em-



Fig. 42.—Bony Ankylosis at the Hip Joint. (From a preparation in the Museum of St. Bartholomew's Hospital.)

ployed to alter the position of a limb, there is usually a strong tendency for the deformity to return, and it is therefore necessary that adequate retentive apparatus, consisting either of well-padded splints or of weight-extension, should be employed.

**Bony ankylosis.**—This is generally the result of suppurative arthritis, which may have been either acute and of short duration, or less acute yet more



prolonged. In acute arthritis it is occasionally produced very rapidly. In a case in which death had occurred from pyæmia following acute arthritis of the ankle joint, resulting from epiphysial disease of the lower end of the tibia, I found on post-mortem examination, which took place just a month after suppuration had commenced in the joint, that the surfaces of the tibia and astragalus were already firmly united by new tissue, in which ossification was very nearly complete. Typical instances of bony ankylosis after prolonged suppurative arthritis, are met with in hip disease, in the course of which the joint may become, as repair slowly advances, completely fixed (Fig. 42). Although, however, bony ankylosis is one of the undoubted results of suppurative arthritis, the statement often made, that when suppuration has occurred in a joint, bony ankylosis is the only method by which repair can take place, is quite inaccurate. Cases are not uncommon in which, notwithstanding that suppuration has been both copious and prolonged, recovery ensues with the preservation of very considerable movement. Indeed, I have met with several instances in which movement was quite perfect, and I have been led to the conclusion that instead of being the almost constant rule, it is rather the exception that suppurative hip disease is followed by bony ankylosis. A doubt has long prevailed whether bony ankylosis ever takes place in cases in which there has been no suppuration. It is impossible to prove the existence of this condition till the joint has been macerated, and a longitudinal section of the bones has been made. I have, however, seen many non-suppurative cases in which the joint had become so fixed that not the slightest movement could be detected when the patient was fully under the influence of an anæsthetic, and in which I believe bony ankylosis had occurred.

It is of course of the highest importance when a



joint is seriously diseased, that mechanical treatment should be adopted, by which deformity may be prevented. The difference between a limb in which bony ankylosis has taken place without deformity, and one in which deformity has been allowed to occur, is too obvious to be pointed out. In the one case the patient has recovered with a limb that, in many instances, is scarcely less serviceable than a natural limb; in the other the reparative powers of nature have been expended in vain, the patient is crippled, and the only means of helping him is to perform an operation which must sometimes be attended with considerable risk.

*Treatment.*—Bony ankylosis with deformity may be treated in various ways.

Our resources in this field have been largely increased by the operation of osteotomy, which is performed through so small a wound that the proceeding may be regarded as little more than "subcutaneous." It is now well known that, when precautions against septic infection are taken, bones thus divided unite with great facility and safety. Indeed, we have in osteotomy a method applied to the skeleton, very similar to that applied to the muscular system in the form of subcutaneous tenotomy. In other words, deformity depending on the vices of the skeleton is now treated by division of the bones that are at fault, just as deformity due to contracted muscles is corrected by tenotomy.

(a) When there is no displacement of the articular ends, and it is only necessary to alter the angle at which the joint has become fixed, it may be sufficient to introduce a chisel in the line of union, and divide the connection between the two bones. Two or three years ago a man was under my care in St. Bartholomew's Hospital with bony ankylosis of his ankle joint, in a position of equinus, following acute pyæmic arthritis. As he was unable to bring his

heel to the ground, and as walking on his toes was very painful, I made a small incision through the skin in front of the ankle, just external to the extensor tendons of the toes, introduced a fine chisel in the line between the tibia and astragalus, and divided the bony union. I was then able, after cutting the tendo Achillis, to bring the heel well down. The patient made a good recovery, and three months later could walk easily on the foot. I have seen very good results obtained by Mr. Willett by a similar operation. Sometimes this proceeding of simply chiselling through the line of union may afford good results in the case of the knee. Usually, however, it would be found impossible to extend the tibia upon the femur, owing either to displacement of the bones on each other, or to the presence of strong adhesions at the back of the joint. In these cases excision is the better operation.

(b) In several cases of ankylosis, with deformity at the hip, following hip disease in childhood, I have made an incision at the back of the joint about three-quarters of an inch in length, just above the great trochanter, passed in my finger to ascertain the position of the neck, or of its remains, and have then with a chisel divided the bone in this situation, and straightened the limb. The proceeding is a very simple one. I have never seen either suppuration, or any other complication, after it; and the limb has readily passed into full extension on the trunk. Extension, however, has not been immediately carried out, but the limb has been gradually brought down with the weight and pulley, as described at page 400. This course has been adopted as being free from violence, and as avoiding the result which might follow forcible extension, of causing the end of the femur to slide upwards and backwards on the dorsum ilii. The objection that might be raised to division of the neck of the femur, namely that the bone having been inflamed,

is unsuitable for operative treatment, has not been realised; in all the cases good repair has been obtained.

(c) In ankylosis of the hip joint, Mr. W. Adams's well-known operation of subcutaneous division of the neck of the femur by sawing through the bone will generally yield a favourable result. The operation, however, is only suitable to cases in which the neck remains of nearly its usual length. This proceeding is one with which the surgeon should be careful thoroughly to familiarise himself, by practice in the dead-house, before attempting it on a living subject. Mr. Adams gives the following directions:—"The left thumb is placed firmly so as to compress the soft tissues against the bone, at a point situated at the centre of the top of the great trochanter, and the breadth of a finger above it. At this point the narrow-bladed knife\* is pushed in till it reaches the neck of the femur, at a right angle across the front of which it is then carried. The knife is then gently moved to cut a space for the easy insertion of the saw, which, traversing the course of the knife, reaches the front of the neck of the femur, and gradually cuts it completely through. The surgeon cuts until he feels that the saw is free of the bone, and moving in the soft tissue only, behind the bone." From what I have seen of these two operations (*b*) and (*c*), I am inclined to think that the first described may be advantageously used in children, but that in the case of the larger and stronger bone in the adult, Mr. Adams's method should be chosen.

(*d*) In cases in which disease of the hip joint has been very extensive, so that the neck of the femur has been lost, and the upper end of the bone has undergone displacement upon the dorsum ilii, where it is imbedded in an extensive deposit of lowly

\* The special instruments used by Mr. Adams are described in a pamphlet on the operation, published in 1871.



organised new bone and cicatricial tissue, it may be best, especially if ankylosis is attended with considerable deformity, to divide the femur just below the great trochanter. An incision three-quarters of an inch in length is made through the soft parts down to the shaft of the femur just below the trochanter major. A chisel, or, as some prefer, a saw, is then introduced, and the bone is so far divided that it will easily give way when the knee is carried towards the middle line. Division of the bone should be mainly effected by the chisel or saw, so that the fracture may be transverse. The limb should be gradually brought down by weight extension (page 400). I lately saw a boy of seventeen, in whom Mr. Willett had performed this operation at St. Bartholomew's Hospital for bony ankylosis, with great deformity of the hip joint, resulting from hip disease in early childhood. The limb after osteotomy was in a position of full extension on the trunk. Adduction, which had previously been very marked, had been entirely removed; firm bony union had occurred, and the boy could walk well on the limb. In two cases in which I have resorted to this operation, at the Hospital for Sick Children, a favourable result has been secured. The operation is easily performed, and is, so far as I have seen, free from all considerable risk. Bony union is the usual result, and I should very strongly hold that this condition is far preferable to any form of ligamentous union, or a false joint. When ankylosis is present, no return of deformity can occur, while with a false joint deformity would be extremely apt to be developed when weight was thrown on the limb.

Bony ankylosis combined with deformity, in the case of the elbow, is best treated by excision, for by this operation a movable false joint will (if sufficient bone is removed—page 316) be secured; a result that cannot be obtained by osteotomy alone.



## CHAPTER XXIII.

## EXCISION OF THE JOINTS FOR STRUMOUS DISEASE.

IN a department of work which is undergoing such rapid development as that which has marked the recent progress of surgery, it is necessary to take note of the point that has been reached, and, in common phrase, to let bygones be bygones. Many instances might be given in which the statistics of fifteen, or even ten, years ago have become obsolete. To quote them as representing the results to be obtained by any given method of treatment at the present time is entirely misleading. This is true, for example, of abdominal surgery, of the opening of large abscesses, of the removal of loose bodies from the joints, etc. It is true, also, on the one hand, of excision of the joints, and on the other of their treatment by rest and its accessories. Excision of the large joints is now a method involving a comparatively slight amount of danger to life, and it is, when performed in the early stage of disease, usually followed by rapid healing of the wound. Those, therefore, who continue to quote the statistics of fifteen years ago, or to work them in with those of recent date, are doing but scant justice to the surgery of the present day. In the same way, the results formerly obtained by the treatment with rest and its accessories no longer represent the true state of the case. Thus, in the Clinical Society's report on hip disease, which dealt with cases occurring in a series of years preceding 1881, it is stated that in forty-five cases of excision performed by Mr. Croft there were eighteen deaths, of which seven were due

to the operation itself, and nine to tubercular disease or albuminoid degeneration of the viscera.

At the present day it is quite certain that the mortality after excision of the hip, in the hands of so able a surgeon as Mr. Croft, would prove to have been very largely reduced; for such complications as pyæmia and erysipelas, which were fatal in five cases, are now very rare; while the cautious selection of cases would still further limit the number of deaths. On the other hand, the results obtained by rest and its accessories have also largely improved. The mortality found to occur at the Alexandra Hospital for Hip Disease was about 33·5 per cent. These figures were arrived at by analysing cases, some of which extended as far back as 1865. A number of these were, like many of the cases excised by Mr. Croft, in an almost hopeless condition when they first came under treatment, and they occurred at a time when it was customary to employ forcible extension for the removal of deformity, and before the method of extension by the weight in the line of deformity—page 401 (which we owe to American surgeons) had been introduced, and when abscesses were either left to form large collections, to burrow widely in the limb, and to burst spontaneously, or were treated by repeated aspiration. But as various improvements have been introduced, and as cases have been brought under treatment at an earlier stage, the mortality has steadily fallen, and now it is, if intercurrent diseases are set aside, certainly not more than about five per cent.

Thus, it still remains to institute an inquiry as to the comparative advantages of excision and prolonged rest as methods of treating diseases of the joints; but it should be understood that we start from an altogether different conception from that formerly entertained of the mortality of hip disease, whether it is treated by early excision or by continued rest. Instead

of being between thirty and forty per cent., it is certainly now, under both forms of treatment alike (and allowing a wide margin) under ten per cent.

In endeavouring to form a correct estimate of the value of excision in the treatment of diseases of the joints, several points offer themselves for consideration. In the first place we must take notice of the fact that the excision of a joint, though the loss is less, is the same in principle as the amputation of a limb. It is the cutting away of a part, instead of the cure of the disease in which the part has become involved. It is like removing the eye-ball instead of curing the glaucoma or other disease by which the eye has been attacked. However favourably or safely repair may be accomplished, the fact remains that the patient has suffered a serious mutilation in the sacrifice of an important organ. It is a proceeding, therefore, which should be reserved for cases in which it is believed that no means of less severity will suffice. Secondly, it must be observed that the necessity for such an operation will vary with the stage of progress which surgery has reached. Although excision had been occasionally performed before 1850, it was about this time that the operation was introduced into common practice by Sir William Fergusson and other surgeons of his day. At that date comparatively little attention had been paid to diseases of the joints, and their treatment was but little understood. Under these circumstances they frequently grew worse and worse, until amputation became necessary in order to save the patient's life, or to rid him of great suffering. Here was a great opening for excision, and it was undoubtedly a great step in advance when Fergusson and his contemporaries resorted to the operation as a substitute for amputation; when, instead of amputating the limb, they circumscribed the loss, and merely excised the affected joint. This was, as it was held at



the time, true conservative surgery. Since Ferguson's day, however, diseases of the joints have been studied by a large number of observers, both in England and abroad, especially in America, and other means of treatment have been established. It has become a matter of every-day knowledge that if these affections are treated from their commencement by rest, and if, should pus form, it is evacuated at once by methods that are familiar to every surgeon, the inflammatory process can be arrested in its early stage, before serious harm has been done, and before deformity has taken place. Thus, the choice is no longer, as it was in Ferguson's day, between excision and amputation, between the loss of a joint only and the loss of a limb: it is between excision and the cure of the disease by rest early applied and sufficiently long continued. Can it be doubted which method, wherever it is possible, should have the preference? On this point the middle and upper classes, acting on the advice they receive, have returned a decided answer. The operation of excision is almost unknown among them. Were the operation the best method of treatment, many of the rich, among whom inflammatory joint affections are frequently met with, would certainly avail themselves of it. In the fact that those who could most readily secure all the advantages which it has to offer have entirely discarded it, we may trace the strongest proof that excision, under favourable conditions, can be, and had better be, avoided.

The improvement which has taken place in the treatment of wounds in the last twenty years has told with great force in the immediate result of the operation. Excision was formerly often fatal, and in many cases in which the patient survived various complications arose, and amputation had to be performed. At the present day, in cases that are carefully selected,



and adequately treated after the operation, no serious complications usually arise, and favourable repair is the rule. The defects of excision, however, lie chiefly in the ultimate condition of the limb. The limb, especially when the operation is performed on children under nine or ten (and inflammatory disease is much more prevalent before than after this age) is often very unsatisfactory. It remains short and weak, and becomes, in many instances, seriously distorted. I think there can be no doubt that though cases are sometimes met with in which a result that no candid observer will fail to pronounce excellent has been secured, the limb, after excision of either the hip or the knee, is usually very inferior to the average limb that is obtained when recovery has followed the treatment by rest. In the future this comparative inferiority must become more and more marked, in proportion to the degree in which the treatment by rest is the earlier adopted and the more effectually carried out.

Main arguments, with some surgeons, for the frequent resort to excision are: (*a*) that these chronic diseases of the joints are tuberculous in their nature, and, therefore, that repair will not take place without operative interference. This, however, is a proposition to which a large number of observers will not assent. In the first place, the presence of tubercle in many cases is very doubtful: while it is assuredly the fact that, with rest, recovery will, as a rule, except in very advanced disease, be secured: so that we are driven to the conclusion either that these cases are generally not tuberculous, or that if they are, tuberculous disease is readily cured by rest. (*b*) That as the local disease may become a centre for general tuberculosis, it is advisable to remove the infected structures, so as to avert this complication. To this the reply is, first, *that, as I have just said, in many instances the proof*

of the existence of tubercle is wanting: secondly, that it is impossible to ensure the complete removal of all tuberculous deposit by excising the joint, for some may be left in the wound, or there may be deposits elsewhere: and thirdly, that the occurrence of general tuberculosis, though it is sometimes met with in the course of chronic joint disease, is much less common than some have believed, especially when cases are treated by early rest and the evacuation of matter as soon as it is detected. (c) A further contention in favour of excision has been that the operation saves time. The amount of time saved, in the case of the hip joint, the instance to which this argument is chiefly applied, depends on the stage of the affection at which the operation is performed. In advanced instances, in which the bones have become extensively affected, and in which suppuration has taken place, and sinuses have formed, the time saved is not very considerable. In the report on Hip Disease the Sub-committee of the Clinical Society\* state that the average period of treatment in cases of verified cures at the Alexandra Hospital (in which no operation was performed) was two and a half years; while in Mr. Croft's cases of excision it was a year and three-quarters; that is, the time saved was nine months. This, if taken alone, would be a material point in favour of excision; but against it have to be placed the risks of excision, which, in these advanced cases, are largely increased; the mortality in Mr. Croft's cases was about 15·6 per cent.:† and the fact that the limb after excision is less useful than that after prolonged rest.

The delay in recovery after excision, when the operation is performed in advanced cases, has led some surgeons to the conclusion that the operation, in these instances, has been too long postponed,

\* Vol. xiii. p. 225.

† *Ibid.* p. 225.

and that it ought to be performed at a much earlier stage. Thus Mr. Croft,\* after urging early operation, says, "When there is fluid in the joint antiseptic incision should be made, as if the surgeon intended to excise, and he should only desist on finding the articular structures in a condition in which they could rapidly recover and yield a movable joint. When pus is known to be present, even if the surgeon is uncertain with regard to the state of the bone, he should excise."

I feel that I am on firm ground when I strongly dissent from this course, for my own experience coincides with that of the great majority of English surgeons in showing that, in the early stage of joint disease, excision is entirely uncalled for. As stated at page 102, cases at this period, when they are treated by rest and the antiseptic evacuation of matter, usually recover, and that without deformity or shortening, so that a much better limb is obtained than that left after excision; and in a considerable proportion of instances the movements of the limb are but slightly impaired. In some, indeed, movement is absolutely free. No doubt a large proportion of rapid recoveries may be obtained when the operation is performed in cases in which the amount of disease is slight. The point, however, is that to perform excision at this stage is equivalent to the removal of the eye-ball for incipient disease, which can be cured by means that are compatible with the preservation of a useful eye.

The various points that have been mentioned appear to show that the operation of excision, as a method of general application, is open to very serious drawbacks, and that, although it has been a link in the chain of progress, and has had the important effect of very largely diminishing the number of amputations

\* Clin. Soc. Trans., vol. xiii. p. 71.



performed for joint disease, it rests on a principle that will be of more and more rare application as surgery advances. There is every ground for hope that better things are in store for us than that it should remain necessary to sacrifice such important organs as the hip joint and the knee joint for diseases that commence as mere subacute inflammations, which disclose themselves from the first by symptoms with which, at the present day, every surgeon is familiar; which are readily amenable to treatment that requires only patience and care, assisted by good nursing, to carry it out, and which, in the great majority of cases, end either in complete recovery or the preservation of a useful, though a partially stiff, limb. I believe that in the future excision will fall more and more into disuse, as the treatment by rest gradually wins its way.

At the present time, however, many children among the poorer classes are unfortunately left month after month without adequate treatment. This arises sometimes from want of knowledge on the part of their parents, sometimes from defective hospital accommodation, sometimes from the fact that the surgeon who is consulted, and whose attention is perhaps largely occupied in other departments of practice, is imperfectly convinced of the beneficial effect of rest, and therefore does not insist on this method being fully carried out. Under these circumstances cases frequently present themselves at the general hospitals, in which disease has advanced until, in the hip, profuse suppuration has become associated with deformity; or in the knee dislocation of the tibia outwards and backwards to a degree which cannot be remedied, and which renders the limb useless, has occurred. Under these circumstances excision must still be resorted to, not because the results obtained are attended with any large amount of success, but because the operation is the best method of treatment that remains to be



adopted. In speaking of the operation in these otherwise unmanageable cases I wish to do it full justice. It undoubtedly often secures a better limb than could be obtained by any other means. Yet, on the other hand, in the case of the hip, the operation often fails to benefit the patient. The wounds remain unhealed, suppuration continues as copious as before, and the case drifts farther and farther towards an incurable stage, unless amputation is performed. While, in the case of the knee, although in a majority of the cases the wound heals and there are no complications, the limb is subsequently short, weak, and, in many cases, deformed.

These views, which have made me, in company with the majority of English surgeons, rather turn away from excision than regard the operation as a common resource in the treatment of scrofulous joints, have reference principally to the cases of the hip and knee, the instances in which it is most important to come to a correct judgment respecting this proceeding. But the question must be shortly considered in regard to all the joints individually.

**The shoulder.**—Excision of the shoulder joint is very rarely either required or performed for scrofulous disease, for, owing to the readiness with which the movements of this joint are vicariously performed either between the scapula and thorax, or at the elbow, this articulation when diseased can be placed at rest; and the inflammatory process is usually neither acute nor destructive. There is, moreover, no tendency to deformity. I do not remember ever to have seen this joint excised for scrofulous disease in childhood. Were the operation necessary it should be performed by making an incision from the tip of the acromion downwards for about three inches in the line of the long tendon of the biceps and *extending to the bone*. The wound is then retracted,

the sheath of the tendon divided longitudinally, and the tendon is hooked aside and carefully protected against injury; the supra- and infraspinatus muscles are divided at their insertion into the greater tuberosity of the humerus, the bone being for this purpose rotated inwards; the subscapularis is then divided, the humerus being, at the moment, strongly rotated outwards, and the point of the knife being kept as close to the bone as possible. The head of the humerus, when any remaining parts of the capsule have been severed, will now be exposed, and the neck is cut through just below the head. The glenoid cavity is very rarely diseased, and may be left without interference. When bleeding has been arrested, a drainage tube should be inserted, and the wound closed with sutures. No splint is required, the arm being bandaged to the side, and the fore-arm and hand across the chest. Thus, excision of the shoulder joint really consists in removing the head of the humerus. In the few cases of excision of this articulation for other conditions which I have seen the result has varied. In some the arm has been wonderfully useful, and the new "joint" has been steady, and has admitted of considerable movement. In others, however, movement has been very limited, and the arm itself has been so weak as to be virtually useless, though the movements of the fore-arm have been preserved. On the whole, the operation is deservedly unpopular.

**The elbow.**—At the present time numerous cases are met with in which scrofulous disease of this joint has been left without adequate treatment till the articulation has become disorganised and sinuses have formed. In many instances disease has begun in the bones (page 125), and has subsequently involved the joint, so that with the joint affection there is combined extensive caries of either the lower end of the humerus or the olecranon process of the ulna. Although these

cases would usually at length recover with long-continued rest, the best course, under the conditions in which the children of the poor are placed, often is to perform excision. The objections that apply to the operation in the case of the hip and the knee are not in force here. That is, the proceeding is much less formidable than it is in these large joints, and ligamentous union, easily obtained, is all that is required for the future usefulness of the limb. This condition, however, would be fatal to the usefulness of the limb after excision of the knee, and is often a source of great lameness and weakness after excision of the hip. The shortening of the upper extremity due to excision of the elbow is of very much less importance than is that which follows excision of the hip or the knee.

Excision of the elbow must be carefully performed, with the smallest possible injury to the surrounding soft structures. Here, as in the case of the wrist and the hip, the manner in which the operation is carried out has a very material bearing on the future usefulness of the limb. Usually a single longitudinal incision is all that is required, and it is better to prolong this than to convert it into a T incision by making a transverse cut running outwards from its centre, as described in many of the handbooks. This longitudinal incision begins about two or three inches above the joint, in the middle line, and is carried downward just internally to the tip of the olecranon, and continued for about two inches along the posterior ridge of the ulna. It extends to the bone. All the soft structures *en masse* are then very carefully turned off the internal condyle. The ulnar nerve imbedded in them ought not to be seen. There is less danger in cutting this nerve as it passes behind the condyle (for every one is cautious here) than there is of dividing it below the joint; for on leaving the back of the condyle and *entering the fore-arm* the nerve turns a little outwards,



and tends to approach the ridge of the ulna ; so that if the operator, after clearing the condyle, uses his knife freely an inch or thereabouts lower down, the nerve will be in imminent danger. When I was Demonstrator of Surgery I found that it was at this point that beginners usually cut the nerve. The accident may be avoided by keeping the knife close to the bone and never thrusting its point out of sight deeply into the muscles. Another important point is that the anconeus muscle should be preserved. In the usual operation not only is the connection between the triceps and the ulna divided (this cannot, of course, be avoided, since the olecranon is removed), but the anconeus, when the transverse incision is made, is cut across. The result is that the patient is left without any extensor of the fore-arm, and thus in many instances, though other movements are regained, and the fore-arm is strong, the power of extension is very small. If, however, the anconeus is saved and is carefully turned off the ulna to a point just below the olecranon, but no further, and is then retracted, it will subsequently, by undergoing development, constitute an extensor of considerable power. Some years ago the late Mr. Maunder showed a patient at one of the Societies on whom he had thus operated, and who could strike a heavy blow with the arm ; a matter of importance to him, as he was residing in one of the newly-established colonies where he was often called upon to defend himself from personal violence. When the soft parts have been so far detached that the olecranon is exposed, this should be removed with cutting forceps ; and then the condyles of the humerus should be also cut through. It is often best to remove first one and then the other, for by this course the operation may be completed with far less injury to the surrounding muscles than is inflicted when the condyles are made to protrude through the wound. When



bleeding, if there is any, has been arrested, the wound well sponged out with carbolic lotion, drainage secured, and the incision closed with sutures, the limb should be placed on a rectangular splint. If favourable healing occurs, passive movement should be commenced at the end of a fortnight by altering the angle of the fore-arm with the arm : at first moving it, every day, a few degrees towards extension, and when it has been nearly straightened carrying it from day to day towards flexion. As soon as the wound has closed, and the soft parts are free from considerable swelling, the patient may be allowed to be up, to discard the splint, and to use the limb (at first, of course, very gently), so as to develop the wasted muscles. Free movement will generally be regained. But, in order to secure this, there should be an interval of about half an inch between the ends of the bone when the limb is placed on the splint. This interval may usually be provided by drawing the fore-arm a little away from the arm ; but if, when the bones are brought into position, it is found that they are in contact, it is better to remove a further portion.

**The wrist.**—Excision of the wrist for scrofulous disease is seldom required. So far as I have seen, this joint is very amenable to treatment by well-fitted leather splints (Fig. 48) constantly worn. If splints are applied in the early stage, it seems to me to be no exaggeration to say that recovery may be very confidently reckoned upon. It is merely a question of time, from three to six months. Perfect movement is usually preserved. At least, I have seen this result over and over again. In neglected cases, which have gone on to suppuration and caries, prolonged rest, secured by the same form of splints (cut away, however, where pus escapes) will still, without doubt, in the great majority of cases lead to sound repair. But when many sinuses have formed, and when the

soft parts are infiltrated and considerably swollen, prolonged rest may fail, and some operative interference becomes necessary. In such cases, I have seen much better results obtained by following up fistulous passages, and extracting the individual carpal bones that are found either necrosed or extensively carious, and cutting away pulpy synovial membrane, than by performing a systematic excision. I have, it is true, seen a few excellent results after complete excision of the wrist; but these have been far outnumbered by instances in which, though after a very prolonged period sound healing had been secured, the hand was almost entirely useless. Thus, I would strongly urge that the operation should only be resorted to in instances in which every other means short of amputation has been fully tried and has failed. In many cases that looked hopeless when first seen, the splint treatment has been quickly followed by improvement, and improvement by ultimate recovery.

**Excision of the hip.**—I have already alluded to the general question of excision of the hip joint, and have adopted an adverse view respecting the operation. It would not be easy to find a subject upon which more divergence of opinion still exists. Some surgeons scarcely ever resort to the operation. Some maintain that it should be performed as soon as suppuration is detected. I have endeavoured to look at the question without prejudice, and from every point of view. Many considerations must be taken into account. In the first place, the results to be generally obtained by continued rest are such as to render a large operation totally uncalled for. I am convinced that the mortality is not more than, at the most, five per cent. I am equally convinced that, in a large proportion of the cases (seventy per cent., I should say) recovery with but slight lameness, and but slight loss of movement, takes place. I have met with many

cases in which, three or four years after the disease had been cured by rest, it would be impossible to pick out the former patient from a group of healthy children with whom he had been placed. When suppuration has occurred, matter may be removed antiseptically, and the abscess will close, in periods varying from a fortnight to five or six months, no rise of temperature usually taking place. Deformity may be removed by weight extension, and recovery will be secured with very little shortening (less than an inch), often with movement that is but slightly impaired, and with very slight lameness. The mortality of this group is, at the most, six to eight per cent. I believe it is not so high. In cases which have been some years in progress, in which suppuration has long been profuse, in which the bones are extensively carious, and in which the general health is seriously impaired, especially if general tuberculosis has set in, or if amyloid degeneration has become established, the mortality rises at once to some twenty or thirty or even fifty per cent., under whatever treatment is adopted. In this group I have, for my own part, no doubt that if prolonged rest, extending over two or three years, can be secured, if sinuses are opened so that drainage is provided, and if an operation is performed for the discovery and removal of any large sequestra that are present, the results obtained will be better than can be secured by excision. The mortality will be less, and in the cases that recover the limb will be more useful.

Much difference of opinion exists as to the frequency with which hard sequestra of any material size are present in suppurative hip disease. By some it is held that they frequently exist, and that their presence determines the necessity for operative interference. Many, and I must rank myself among the number, dissent from this view. It is well known, of course, that, generally as the result of acute inflammation, but



sometimes in chronic disease, the epiphysial head of the femur undergoes necrosis in mass, and becomes separated so as to form a loose sequestrum, which will continue to provoke suppuration until it is removed. These cases, however, are comparatively rare. Again, it often happens that in the progress of chronic hip disease both the upper end of the femur and the floor of the acetabulum become extensively carious, and are found during the operation of excision to break down very easily, and to come away in large fragments, which some term sequestra. These masses, however, are formed of porous friable bone, readily crushed between the fingers. Their structure is such that, should the operation not be performed, they will crumble away and disappear, and will not prevent repair. This seems to be proved by the fact that in numerous cases in which profuse suppuration has been going on, so that there can be no reasonable doubt that extensive bone disease has been present, all the sinuses will close, although no bone has either worked out or been extracted. In these instances we must conclude either that no sequestra were present, and in that case it would appear that sequestra are not so common as some believe, or that they often crumble away and are discharged, so that operative interference is by no means essential for their removal.

The estimate that I have been led to form is (*a*) that in the early stage of the disease, although matter is developed, the operation is unjustifiable upon the ordinary principles of surgery, as unjustifiable as it is to remove a testis, an eye, or a tooth, for incipient, but still curable, disease; (*b*) that the operation is generally uncalled for, even when sinuses have formed; (*c*) that if hip disease has been allowed to reach the stage in which the bones have become extensively carious, in which matter has burrowed widely, and in which the general health has become seriously affected, excision



will be of very doubtful benefit. The operation itself will be fatal in at least ten per cent. of the cases, while in another twenty or twenty-five per cent. it will be followed by no improvement in the patient's condition.

These statements may appear too general, and I may be asked for statistics. I have, however, long felt that this is a question in which statistics are very apt to mislead any one who endeavours to determine how the particular case he has in hand (and each one should be treated on its merits) should be managed. It is useless to collect a hundred cases that have reached every stage of disease, and which resemble each other only in the single point that excision was performed, and quote the aggregate results. By this method, instances of an utterly dissimilar nature are thrown together, and none are seen in their true light. Such a process is like collecting a hundred prisoners, some of whom have thrown a stone through a six-penny square of glass, while others have committed murder, and averaging their sentences, instead of trying each case individually, and pronouncing sentence accordingly. I feel reassured, in expressing the opinion I have given above, by the knowledge that my views are in full accordance with those of my colleagues, both at St. Bartholomew's Hospital, and at the Hospital for Sick Children. At St. Bartholomew's Hospital the operation is very rarely performed except when the disease has reached stage (c) in the groups just mentioned; and even in these cases it is but rarely undertaken. At the Hospital for Sick Children, although the staff in charge of beds includes among its members, besides myself, surgeons from St. Mary's (Mr. Edmund Owen), Charing Cross (Mr. John H. Morgan), and St. Thomas's (Mr. Bernard Pitts), the opinion that excision should be performed only when other means have been fully tried and have failed, is unanimously held.

Although, however, the operation is so often disappointing, there are some conditions of disease in which resort to excision affords the patient the best prospect of recovery. These are as follows :

1. When the whole head of the femur, or what remains of it, has become necrosed, and detached so as to form a loose sequestrum. In these cases (page 382) the removal of the head is, as I have several times witnessed, followed by rapid recovery. This proceeding, however, is not, strictly speaking, an excision, but merely an operation for dead bone, the advisability or probable success of which no surgeon would call in question.

2. When, in spite of three or four months of complete rest and free drainage, suppuration remains copious, and the general health is giving way, provided, however, that there is no evidence of extensive disease either of the femur or the pelvis, and no wide burrowing of matter in the limb. When the femur is the seat of chronic osteo-myelitis, which sometimes involves the greater part of the shaft, amputation is the only adequate operation, and when the pelvis is extensively diseased, excision will be useful only in securing free drainage. The gouging away of carious bone from the pelvis will seldom be attended with any good result.

3. When, along with continued suppuration, there is so much displacement of the upper end of the femur that the limb cannot be brought into good position without operation. Here excision may serve the double purpose of removing distortion and limiting suppuration.

In any of the above conditions the appearance of enlargement of the liver, or of albumen in the urine, showing that amyloid disease of the viscera has set in, may be an additional ground for excision ; for if the operation can arrest suppuration, the internal organs

may perfectly recover. When, however, amyloid disease is of long standing, the operation will not only be generally useless, but it will involve a considerable and immediate danger to life.

In cases of prolonged suppuration, much improvement may sometimes be secured by an incision into the back of the joint, and the removal of any fragments that are found to be loose, and by providing a free exit to pus that has been confined on the pelvic aspect of the acetabulum. Such an operation will often virtually amount to excision, for if pelvic abscess is present, the remains of the head of the femur had better be removed, so that matter can more easily escape.

*The operation.*—Much, as to the danger to life and the future usefulness of the limb, depends on the manner in which excision of the hip is performed. The old method, by which an incision five or six inches long was made at the back of the joint, all the muscles detached from the great trochanter, the upper end of the bone thrust through the wound, and the shaft divided at the base of the great trochanter, has been superseded by an operation of comparatively slight severity, and one which interferes much less seriously with the functions of the limb. A straight incision, two or three inches in length, is made from the apex of the great trochanter obliquely in the direction of the fibres of the glutei, and extending down to the back of the joint. The capsule, if still present, is then opened, the situation of the neck of the femur, or its remains, is ascertained, the bone is divided with a saw, or cutting forceps, and the fragment is removed. The floor of the acetabulum is then carefully explored, and any sequestra that are detected are extracted. If the acetabulum is perforated, and abscess has formed in the pelvis, sufficient bone is removed with a gouge to secure free



drainage. Bone, however, should not be freely gouged away merely because it is inflamed and soft. Such bone may be left for future repair. The section of the femur should next be examined. Should the bone be extensively carious, or the seat of destructive osteo-myelitis, a further portion should be removed, and it may even, in rare cases, be necessary to cut away the great trochanter. Such a step, however, so largely interferes with the future usefulness of the limb, that it should be, if possible, avoided. When any hæmorrhage that is going on (but this is usually quite trivial) has been arrested, the wound sponged out with an antiseptic solution, a drainage of gutta-percha tissue inserted and the incision closed, the limb is placed either on a long splint, interrupted opposite the hip, or weight extension is employed to steady it (three pounds are usually sufficient), sand-bags are placed, one on the inner and one on the outer side, and a cradle is placed over the foot. I prefer the use of the weight. Care should, however, be taken that no undue traction is made on the limb, for then the upper end of the femur would be drawn too far away from the pelvis, and an over-long ligamentous union would result. Performed in this manner, excision of the hip involves so small a wound, and is attended with so little injury of the neighbouring parts, and with so little hæmorrhage, that it is borne by children who are too feeble and exhausted to tolerate a large operation, or to repair an extensive wound. As soon as the wound heals, the patient may be up on a Thomas's splint and crutches. (*See Fig. 58*). He should not bear weight on the limb for at least three months after the parts are soundly repaired. Should closure of the wound be delayed, and free suppuration continue, the question of the removal of the limb must be discussed (page 419). But should discharge diminish, and the general health improve, the patient should be allowed to be



up, with a Thomas's splint and crutches, so that he has the advantage of fresh air to promote his ultimate recovery.

**Excision of the knee.**—In the middle and upper classes, in whom joint disease is detected early, and treatment is applied by which the inflammatory process is arrested before operative interference has become necessary, excision of the knee is scarcely ever performed. At present, however, there are many among the poor, who can neither be adequately treated at home nor retained in a hospital for the necessary time, and in whom disease, though it may never assume an acute form and never lead to suppuration, is allowed to go on from month to month, or even for years together, until not only the synovial membrane has passed into a condition of advanced pulpy degeneration, the ligaments have been softened and in great part destroyed, and the cavity of the joint has become obliterated by the formation of adhesions between the ends of the bones, but the tibia has undergone irremediable displacement into the popliteal space. In such instances—which I will term group (*a*)—no treatment short of an operation can restore the limb to use. Here excision will yield the best attainable result, and when it is performed under safeguards against septic changes in the wound, it involves but a small amount of danger to life, and very little chance of the failure of sound repair. In this group of cases excision is an appropriate and serviceable operation.

(*b*) Sometimes, added to the features just noticed, there is disease of the ends of the bones, attended with chronic suppuration. In these cases excision will often be followed by firm union, though the process of repair will be tedious, owing to the fact that during the operation it is necessary to gouge away part of the bone, so that a cavity is left which is only slowly filled up.

(c) The operation may sometimes be advisable in patients between the ages of eight and twenty-five, in whom, as the result of chronic disease, the synovial membrane has become the seat of bulky thickening and "pulpy degeneration." These cases are very inveterate, and many are incurable under prolonged rest. Excision may be recommended if the patient's general health is sound. When the ends of the bones have been removed, the diseased synovial membrane should be freely removed with scissors. An alternative method of treating these cases is given at page 115.

(d) It is the custom with some surgeons to excise the knee joint when it is the seat of active inflammation, or suppuration, and when the articular ends of the bones are in a condition of considerably increased vascularity.

No doubt excision, under these circumstances, is attended with vastly less danger than it involved only a few years ago. A few years ago such an operation would almost certainly have been followed by osteomyelitis or septicæmia. It is in such examples that the advance in the treatment of wounds is so conspicuous. Still, though operators who have carefully devoted themselves to this form of practice may be able to show satisfactory results, those who are not familiar with every detail of the antiseptic treatment will be well advised not to venture upon excision in these cases. It will be safer to adopt the plan described at page 112.

The frequency with which surgeons resort to excision of the knee will depend on the object which they propose to secure. For my own part, and I am here subscribing to the opinion of the great majority of English authorities on the subject, the cases in which the operation is mainly required are those where irremediable displacement has occurred. In other words, it is not so much the amount of disease,

as the presence of deformity, which renders the proceeding advisable. In many cases, indeed, in which the disease has either become already cured, or is so slight that it would readily yield to treatment, the operation is still required in order that the limb may be placed in a position in which the patient can walk



Fig. 43.—Deformity occurring after Excision of the Knee Joint.

upon it. So long, however, as no material displacement has occurred, I feel excision need not be performed, for repair can be obtained by rest and its accessories. Others resort to excision of the knee as freely as they employ excision of the hip as a means of arresting active disease. I am opposed to such a practice on the ground that even if sound healing is secured, and this is by no means always the case, *the limb is likely to be less useful than that which is*



obtained by the treatment by rest. The age of the patient is a very important point in respect to excision of this joint. In children under six the operation is highly unadvisable, for in all but the worst cases disease may be cured by rest, and with the growth of the limb deformity, even though it is considerable, will gradually disappear (page 443). At this early age the ends of the bone are still formed partly of cartilage, and as firm union cannot be obtained, subsequent deformity is very likely to occur (Fig. 43), and the growth of the limb, moreover, is likely to be arrested. The best age for excision is from twelve to eighteen, when the limb has attained the major part of its growth, and when the processes of repair are still very active. In adult life the dangers attending the operation increase so rapidly that, in the opinion of the majority of surgeons, it should not be undertaken after about the age of thirty. I have seen it fatal by shock when performed on a female patient of forty. Mr. Gant, however, has recorded a successful case in a patient of fifty-three.\*

The constitutional condition of the patient must be investigated. So large an operation should not be undertaken unless the patient's general health is good, and his strength unimpaired. In the course of 1885 a young man of twenty-three, whose knee, after gonorrhœal arthritis, had become ankylosed nearly at a right angle, came under my care at St. Bartholomew's Hospital. Excision was the only means by which the limb could be rendered serviceable, and it was arranged that the operation should be undertaken. But I found that he had a trace of albumen in his urine. The specific gravity, however, was 1020, and the amount of urea excreted was normal. Having watched him for a fortnight, and observed that the amount of albumen was never more than a

\* *Med.-Chir. Trans.*, vol. lvi. p. 213.



mere trace, while on some days none was present, I regarded the case as one of albuminia of adolescence, and performed the operation. For the first few days he had a temperature of  $103^{\circ}$ , and was sick and very restless. Subsequently profuse suppuration took place, the edges of the wound separated, he lost flesh rapidly, and grew so weak that I was afraid amputation would be necessary. At length, but not until about six weeks after the operation, he began to improve, and finally left the hospital with the limb firmly repaired. During the time that he was seriously ill the amount of albumen became considerable. In cases in which patients have had measles or any of the other exanthemata, or any serious illness, the operation ought to be postponed for at least six months.

**The operation.**—Of all the excisions that of the knee is the most important as a surgical operation. The wound is more extensive, and the surfaces of the bone exposed are larger than in any other case. It is the only instance in which it is necessary to secure bony ankylosis. In other excisions movement of the bones, after the operation, is of little importance. Indeed, passive motion is called for at the end of about three weeks; but here, unless the bones are originally placed, and subsequently maintained for some six or seven weeks, in close and accurate contact, failure is very likely to result; while should it, from any cause, become necessary to remove the splints and put the excision up again within the first month, the case will generally end in disaster.

The success of the operation is largely dependent on the form of splint employed. The main difficulty, especially when the bones of the leg are considerably displaced backwards, is to prevent the riding of the femur in front of the tibia. The plan of firmly bandaging the lower end of the femur to the back splint leads to great swelling about the wound, and

materially retards repair. It is apt also to induce persistent venous oozing after the operation. To avoid these drawbacks I have employed Mr. Gant's splint with great advantage. It is very simple and, I think, very effectual. It consists of (a) a simple back splint (a little trough-shaped, and a little wider

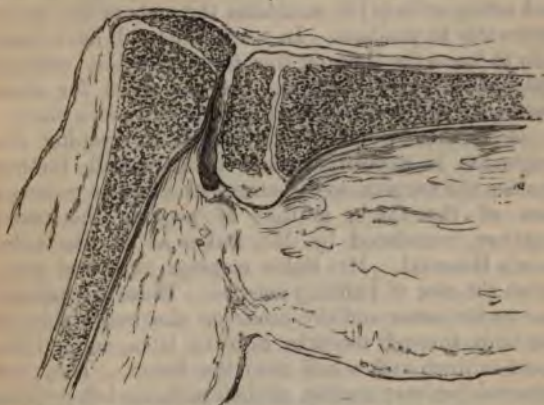


Fig. 44.—Riding of the Femur in front of the Tibia. (From an old preparation in St. Bartholomew's Hospital Museum.) The limb was amputated some months after excision had been performed.

above than below, to correspond with the outline of the limb), extending from just below the tuberosity of the ischium nearly to the ankle. This is padded all along; but an extra pad is placed upon its lower half, where it corresponds to the tibia. By this means, instead of binding the femur down to the level of the tibia, the operator lands the tibia up to the level of the femur, so that no tight bandaging is employed. The amount and disposition of the extra padding must, of course, vary with the case. When the limb has been accurately adjusted and secured on

the back splint with wide pieces of strapping, not tightly drawn, and a bandage, the second part (*b*) of the apparatus is applied. This is formed of an outside splint extending from the great trochanter to the foot; it is furnished with a footpiece, and is interrupted at the knee so that the wound can easily be dressed. This (*b*) has the effect of steadying the limb, and acting with (*a*) it maintains the ends of the bones accurately in position. In several cases I have been able to leave the limb on this form of splint without disturbance (only changing the dressings) for eight weeks, by which time sound healing has taken place.

A method which greatly assists in keeping the fragments in apposition, and therefore still further enables the surgeon to dispense with circular constriction of the thigh, is that of pegging the bones together, introduced by Mr. Baker at St. Bartholomew's Hospital. Mr. Baker employs two steel pins, about the size of knitting needles. These are passed, one on the inner and the other on the outer side of the limb, through the skin into the tibia, and on for about an inch and a half into the femur. They are removed (an easy matter, as their ends are left projecting) on the tenth to the twelfth day. Mr. Willett prefers bone pegs, which are cut off short and allowed to remain. I have used these bone pegs in six cases. They certainly fix the ends of the bones in a very satisfactory manner. I have allowed the ends to project and have left them in place for a month, till all chance of movement between the bones has passed by. In some instances I have found the pegs by this time so firmly held that I could not withdraw them, and I have, therefore, cut them short off and left them; others have been loose and have been easily removed.

A modification of the operation as usually described in handbooks of operative surgery, and in the text-



books, by which the patella is removed, is that practised by Mr. Golding Bird.\* In this method the patella is sawn across and its two portions retained, one being turned up and the other down. When the operation is completed, these pieces are replaced and united closely by two stout carbolised silk sutures, which are passed, by means of an especially strong-mounted needle, through the substance of the bone in two places. The ends of the sutures are cut short. The case shown by Mr. Golding Bird to illustrate this proceeding was an excellent one. The patella was freely movable. In a case in which I adopted this plan, but in which a stout silver-wire suture was used in place of silk, a very strong limb was obtained, on which within six months of the operation the patient, a boy of fifteen, walked from London to Great Yarmouth, a distance of about 120 miles, in seven days, thus travelling about eighteen miles a day. On examining the limb a month after this journey, I found it quite firm, and free from any bend. This method may very well be adopted in cases in which the patella is free from disease, and in patients above the age of eight or ten. But when the patella is involved in disease, or when it is still in part cartilaginous, it will probably be best to remove it.

If excision is performed in cases in which the ends of the bones are the seat of inflammation, especially if this is acute, the inflammatory process is very likely to continue after the operation, or to enter upon a still more active stage. Two years ago I excised the knee joint of a boy seven years old. Disease had commenced in the head of the tibia nine months before, and had soon involved the joint itself. It was now in an active stage, attended with pain, and a temperature of 102°. Suppuration had taken place, and about two drachms of matter could be felt beneath the skin. The

\* Clin. Soc. Trans., 1883.



generally, and in all but the most advanced cases, amenable to treatment by rest and its accessories; while, should disease have reached a stage at which operative treatment is required, Syme's amputation will be, as a rule, preferable to excision of the joint.

Excision usually fails, either because the neighbouring tarsal joints become involved in the traumatic inflammation which follows the operation, or because the adjacent tendons remain so imbedded in cicatricial tissue that the foot is left weak and defective in its movement, and the limb is less useful than it is after Syme's amputation. All the successful examples of excision of the ankle that I have seen could be counted on the fingers of one hand. I shall not enter upon any discussion of the details of the operation, for I can add nothing to the directions for its performance which are to be found in the text-books.

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## CHAPTER XXIV.

### DISEASES OF THE TEMPORO-MAXILLARY JOINT.

MANY diseases commonly met with in other joints are rare or unknown in the temporo-maxillary articulation; yet there are several affections by which it is liable to be attacked. The chief of these are (a) osteo-arthritis; (b) pyæmic inflammation; (c) strumous disease, which may extend to the joint either from the ear or from the ramus of the jaw; (d) internal derangement or subluxation (displacement of the inter-articular fibro-cartilage). (e) It seems advisable also to allude to a group of cases in which movement in this joint is prevented by spasm of the surrounding muscles, for I have met with several instances

the condition on which this closure of the jaw depended had escaped notice.

(a) **Osteo-arthritis** presents, here, very similar features to those which are observed in the other joints. The disease may attack either young subjects, especially young women who are suffering from anæmia and feeble general health associated with uterine derangements, or persons (chiefly females) over fifty, and who are usually already suffering with the disease in other parts. One or both sides may be attacked. The symptoms are pain and cracking or creaking, especially on movement, stiffness, some general fulness, or even, in rare cases, marked deformity. Adams, in Plate I. of his Atlas, gives an illustrative case, in which considerable deformity and want of symmetry are observed between the two lateral portions of the jaw. "The right condyle is greatly enlarged, the surface of the articular part is rough and scabrous, the interarticular cartilage, as well as the cartilage of incrustation, has been removed. The height of the right ramus and its condyle inclusively exceeded by one inch the height of the same portion on the left side of the lower jaw. The right glenoid cavity is much increased beyond its usual size and capacity; . . . the maxillary eminence has not only been removed, but the temporal bone where it normally forms this eminence, and the root of the zygomatic process, have been much excavated to receive the enlarged condyle." Drawings from the cast of the face and from the macerated skull in this case show the "distorted appearance of the visage and protrusion of the chin to the left side, circumstances anatomically accounted for by the lengthened ramus and condyle of the jaw on the right side." In the later stages of the disease movement becomes more and more interfered with, so that the patient is able to open the mouth to only a very limited extent, and is

unable to masticate food. In a well-marked case that came under my observation the disease had been produced by injury. The patient, a woman of fifty-four, fell and struck her chin upon the edge of a stair. This accident was followed by a persistent form of osteoarthritis involving the joint on both sides, and also the condyle and neck of the jaw, and leading to the same kind of absorption of bone that is met with in the head and neck of the femur after falls on the trochanter (page 64). Both the joints became stiff, so that the patient, at the end of two months, could not separate the teeth for more than a quarter of an inch; the teeth of the lower jaw receded considerably behind those of the upper, so that, as the patient said, she could no longer bite a piece of cotton, and the angles of the jaw became less prominent than before the injury.

*Treatment* in these cases is attended with very imperfect results. Patients often seek advice only when the disease has been slowly advancing for several months, and when serious structural changes have already taken place; but, even at its commencement, the affection proves to be very obstinate. The remedies most likely to be useful are repeated small blisters, which here, as in the case of other joints, tend to relieve both pain and stiffness; hot sponging; warm covering so that the joint is protected from the sudden changes of temperature to which all the parts of the face are generally exposed; and passive movement, effected by the use of a screw-gag, whose blades, which should be covered with a thin plate of cork or india-rubber, are slowly separated when they have been introduced between the teeth. Very little force, however, must be used. The practice of giving an anæsthetic and forcibly opening the mouth with a powerful gag has never, within my observation, been attended with any marked improvement. Usually it not only causes the patient considerable pain, but is



followed, each time it is repeated, by an increase of stiffness.

(b) Occasionally the temporo-maxillary joint is the seat of acute inflammation occurring during some form of **blood poisoning**. I have seen it in pyæmia, and also twice as a sequel of scarlet-fever in childhood. The *treatment* is the same as that which is required in other joints that are the seat of this form of arthritis (page 27). Matter should be evacuated at the earliest moment at which it can be detected. If it is allowed to collect in any quantity, it will not only burrow widely among the important structures of the neighbourhood, and perhaps, as I have seen it, lead to thrombosis of the internal jugular vein, but it may also give rise to meningitis by inducing necrosis of the thin plate of bone which forms the floor of the glenoid cavity at the base of the skull. Another direction in which pus might extend and produce serious mischief is towards the middle and internal ear by making its way through the fissura Glaseri.

(c) In cases of **strumous otitis** attended with suppuration, matter sometimes finds its way from the cavity of the tympanum through the Glaserian fissure into this joint, and in cases in which necrosis of the petrous portion of the temporal bone occurs, the articulation is sometimes entirely disorganised, and movement of the jaw on that side is to a great extent lost. The possibility of the occurrence of this result may well be added to the other urgent reasons that exist for the adequate treatment in its early stage of suppurative otitis. In two instances I have seen matter, formed in connection with strumous periostitis of the external aspect of the ascending ramus of the jaw, make its way into the temporo-maxillary joint. In one of these a large collection of pus had formed, extending from the angle of the jaw to the zygoma. When this was opened the surface of the jaw was



found to be bare, and a probe passed readily into the interior of the joint. The patient, a boy of ten, ultimately recovered, but the movement of the jaw on that side was much impaired.

(d) **Subluxation.**—This condition is briefly described by Sir Astley Cooper.\* It is met with most commonly in young adults, especially in young women, in consequence of relaxation of the ligaments, resulting from feeble health. It may, however, as I have seen, occur in middle-aged or elderly patients as the result of a lax condition of the ligamentous structures such as is not rare in rheumatic subjects, and which so frequently leads to subluxation of the knee. I have related an instance of the affection at page 203. The symptoms are sudden inability on the part of the patient to entirely close his mouth; some deviation of the jaw, so that the symphysis is carried a little over towards the opposite side, and the teeth do not correspond; and some pain. When the condition is of any duration a snap when the slip occurs is felt, and may often be heard even to some distance. In one case the condition followed a heavy blow by a fall on the chin, which had apparently either separated the cartilage from its attachments or torn it across, so that the condyle slipped in front of it and thrust it back towards the posterior part of the articulation. Reduction often immediately follows the slip, or can be at once effected by some movement of the jaw which the patient has learnt will replace the cartilage. In a case in which there was any difficulty, so that a surgeon was consulted, reduction would be best effected by the methods that are employed in the reduction of dislocation of the jaw; but the manipulation required would be slight. It is very difficult to prevent the tendency to the recurrence of this accident, for no mechanical appliances, such as are so efficacious in the

\* "Dislocations and Fractures," p. 266. 5th edit.

case of the knee (Figs. 31, 32), can be used. A main point is that the patient should habitually guard himself against wide movements of the jaw. Small blisters may be applied over the joint. Sir Astley Cooper advises the shower-bath, but the hot douche would be preferable in young and anæmic subjects. Tonics, especially easily digested preparations of iron, should be prescribed if the general health is defective. In many of these cases treatment, though it may be to some extent beneficial, does not entirely cure the affection. The patient, however, finds that the slip becomes less painful, and he also learns how at once to "put his jaw in," so that the condition is not usually a source of any very material trouble. In any case in which the functions of the jaw were very seriously interfered with, and in which all other treatment had failed, the cartilage might be dissected out. The same favourable results might be anticipated here as have followed the removal of the semilunar cartilages of the knee joint. (*See page 214.*)

(e) Closure of the jaw from spasm of the masseter and other muscles may depend on reflex irritation, arising either from difficult cutting of the wisdom tooth, or from disease of one of the other molars. Sometimes it is due to cold. It is most often met with in young adults in connection with delayed eruption of the wisdom tooth. Diagnosis is usually easy, for the evidences of dental irritation are readily detected. In these cases the jaws should be separated by means of a gag when the patient is under an anæsthetic, and the carious tooth should be removed, or a free incision should be made in the gum over the retained molar, so that it may be enabled to make its way through. In some instances (in which the jaw is already filled with closely-set teeth) it is best to remove the wisdom tooth with an elevator. Sometimes the contracted state of the muscle and consequent closure

of the jaw persists, even for several weeks, after the original irritation has subsided. In such instances movement may be restored by opening the jaws once or twice with a screw-gag.

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## CHAPTER XXV.

### DISEASES OF THE SHOULDER.

**Synovitis.**—Simple synovitis, such as is sometimes met with in the elbow and knee, from overwork, cold, etc., is very rare in this joint. Synovitis may, however, arise from either rheumatism or blood poisoning, or it may occur after typhoid or scarlet fever, or it may result from mechanical injury. The symptoms, which will vary to some extent with the nature and grade, as to acuteness, of the inflammatory process, are (*a*) stiffness of the joint, so that the humerus and scapula move together; that is, when the elbow is carried forwards and backwards, or is drawn away from the side, the inferior angle of the scapula travels with it; (*b*) swelling, taking the form of general fulness about the joint, and giving it a globular outline. Swelling is usually limited in strumous synovitis; but it may be very considerable, and attended with obvious fluctuation both in acute rheumatism and the various forms of blood poisoning; often the joint looks more enlarged than it really is, owing to wasting of the muscles of the scapula and upper arm. (*c*) Abnormal heat of the surface may be detected in the more acute forms of inflammation, but in many cases, owing to the thickness of the soft parts over the articulation, this symptom is not present.

*Treatment* must be general and local. The arm must be kept at rest by the side of the trunk by



means of a bandage (not too tightly applied) surrounding the arm and thorax, from the axillary fold to the elbow. The fore-arm should also be bandaged to the chest, or be constantly kept in a sling. The folds of the bandage should be stitched together, or brushed over with starch, to keep them in place. In addition, a shield splint which encloses the shoulder and upper half of the arm is sometimes useful. General treatment should be directed to the condition out of which the joint affection has arisen, whatever this may be, and for a description of which, works on general medicine and surgery may be consulted. In *acute rheumatic synovitis* the joint should be wrapped in cotton wool, and kept at rest at the side. Warm lead and opium, or belladonna lotion soaked in lint and covered with oil silk, may be applied beneath the cotton wool. Sometimes relief is speedily obtained by painting the skin, over an area of two square inches, with blistering fluid. Aspiration of the joint, to relieve tension, is not to be recommended, though it has been practised in some instances. Usually, when inflammation has subsided, movement is either spontaneously regained, or may be restored by the treatment mentioned at page 226. The synovitis following *pyæmia* or *scarlet fever* is usually attended with the rapid formation of a large collection of pus in the joint. Owing to distension of the capsule, displacement of the head of the humerus is not unlikely to occur. The arm should be kept at the side, and the elbow should be supported. The joint may be aspirated, or if the patient's general condition will permit, opened and drained antiseptically. But should distension be only moderate, and not increasing, it is better to refrain from active interference, for if recovery takes place, much or all of the collection may undergo spontaneous absorption, while should interference be ultimately necessary, it may be carried



out under comparatively favourable circumstances. Synovitis following typhoid fever is not usually, or ever in my own experience, attended with suppuration. It is commonly either plastic, so that it leaves the joint fixed; or it leads to serous effusion, which is very apt to induce spontaneous dislocation. This accident must be carefully guarded against. It can scarcely occur if the arm is kept to the side.

**Strumous disease.**—Strumous disease of the shoulder is common in children and young adults. It is usually very insidious and chronic, and sometimes makes considerable progress before it is detected. It may begin either as synovitis (the most usual form) or as epiphysitis of the humerus soon extending into the joint itself. In the latter form the head of the bone is sometimes reduced to little more than a shell, and mischief may even encroach upon the diaphysis. In two cases that I have seen, the head, reduced to a carious fragment, was found to have become separated, as a sequestrum. *Symptoms.*—Pain here, as in so many other instances of strumous joint disease, is often completely absent, or so slight as to be mistaken for “growing pains.” When present it may be felt either in the joint itself, or at the middle of the arm near the insertion of the deltoid. The most prominent symptoms are wasting of the deltoid and the scapular muscles, and stiffness of the joint, the inferior angle of the scapula being found to travel with the humerus whenever an attempt is made to rotate the latter in the glenoid cavity, or when the elbow is brought away from the side. In the synovial form of disease suppuration is rare; but in epiphysitis abscess may be developed, and may either give rise to a large fluctuating swelling beneath the deltoid, or point at the anterior edge of this muscle, or in the axilla. The shoulder is so easily kept at rest, its movements being so readily performed either between the scapula and

the thorax, or at the elbow, that though disease is tedious, the destructive changes and profuse suppuration so often seen in other joints are seldom met with here, and recovery usually at length takes place.

*Treatment* consists in maintaining rest by keeping the arm bandaged to the side, and by protecting the joint by moulding a leather shield splint to the shoulder and upper part of the arm. These means should, even although disease is only incipient, be continued for from three to six months. The plan of painting the joint with tincture of iodine does little or no good, while it is attended with the disadvantage that it renders the skin irritable, so that the child is constantly moving the limb. In the rare event of the joint being painful, notwithstanding that it has been placed at rest, two or three small blisters, one healing before the next is put on, may be used; or better still, the benzoline caustery, when the patient is partially under chloroform, may be lightly applied. Should suppuration occur, matter should be at once evacuated in the manner described at page 411. In epiphysitis of the head of the humerus, the inflammatory process may end in caries, and the interior of the bone may be extensively broken down. Generally, owing to the soft and cancellous nature of the tissue, no firm sequestra requiring removal are produced. Any fragments that are separated are readily disintegrated and got rid of in the discharge. No operation for dead bone, therefore, is usually called for; and the parts had better be left for repair under the influence of rest. Should a sinus, however, remain unhealed in spite of rest of the joint continued for two or three months, it should be explored. If a sequestrum is found it should be gently extracted, but bone that is merely inflamed and soft should not be gouged away, for the mechanical injury involved in this proceeding will tend rather to aggravate, than lead to

the repair of the disease. The advisability, in epiphysitis, of making a free external opening, so as to provide for the escape of matter upon the surface, and thus avert its entrance into the joint, is alluded to at page 139.

I have several times seen attempts made to restore movement in this joint in cases in which it had become stiff as the result of strumous disease in childhood. These attempts have been attended with failure, and in some of them a renewal of disease has been provoked.

**Acute arthritis of infants** (page 127) is common in this joint in the first few months of life. In the early stage, the patient is observed to keep the arm still, and to cry when the limb is disturbed. In the course of two or three days the cavity of the articulation becomes distended with a large collection of pus, forming a globular swelling beneath the deltoid. The skin is generally free from inflammation, but assumes a dusky congested appearance. As large subcutaneous veins become visible, the condition may, as I have more than once seen, be mistaken for malignant disease. If an early incision is made, and drainage established, recovery will generally occur, though the joint may be stiff. I have, however, seen perfect movement regained. If matter is allowed to collect, it will burrow widely (after rupturing the joint capsule) in the axilla and beneath the pectoral muscles, the upper end of the humerus will be destroyed by ulceration, and the patient will very probably die of exhaustion. If the patient survives, the joint will have been so much injured that the arm will remain weak and flail-like. Arrested growth of the humerus after this affection is alluded to at page 143.

**Osteo-arthritis.**—Among the large joints the shoulder is, next to the knee, the joint most often attacked with this affection. The malady generally



commences after the age of forty-five or fifty, but it may occur in patients under thirty. In such instances it is usually only part of a general outbreak of the disease in an acute form (page 62). The ordinary chronic variety begins with pains of a rheumatic character about



Fig. 46.—Osteo-arthritis of the Shoulder Joint. (From a Preparation in St. Bartholomew's Hospital Museum.)

the joint or with a persistent, dull, aching or wearing sensation about the outer aspect of the arm near the insertion of the deltoid. This is accompanied by a feeling of weakness, and with stiffness, especially after rest. All these symptoms increase, often very slowly, and are soon accompanied by muscular wasting, which may become very marked, and by creaking, cracking, or grating of the joint. By degrees the movements of the arm become more and more restricted, and any



attempt at motion causes severe pain. Pain of a severe neuralgic character is often present at night, so that the patient is unable to sleep, or to lie on the affected side. At length, as the original glenoid cavity undergoes absorption, and as new bone is being deposited around its margin, a large articular hollow is developed, extending to, and often in part formed by, the eroded coracoid process (Fig. 46). At the same time the head of the humerus becomes enlarged, partially worn away and misshapen, and displaced upwards and forwards so as to present the appearance of an old traumatic subcoracoid dislocation. A remarkable anatomical feature is sometimes observed in connection with osteo-arthritis of this joint. It consists of the separation of the end of the acromion, so that this process has the appearance of having undergone fracture that has been repaired by fibrous union. The line of separation varies in different cases. In some instances merely the extremity, in others a considerable amount, is detached. In a specimen in St. Bartholomew's Hospital the acromion is divided in two places, the fragments being maintained in position by partially ossified bands of fibrous tissue. Another result is that the long tendon of the biceps becomes displaced from its groove, and often completely worn through.

*Diagnosis* is usually easily made. The age of the patient, the presence of similar disease either on the opposite side, or in some of the other joints, and the manner in which the affection has developed itself, will serve clearly to indicate the nature of the case. In some instances in the shoulder, as in the hip (page 64), osteo-arthritis follows an injury, and may then be met with apart from any manifestation of the disease elsewhere. This form is inveterate, and of the same active type as that which is met with in the hip.

The general *treatment* is given at page 69 *et seq.*

Local means consist of warmth, hot douching vigorously carried out, a series of small blisters when pain is marked, and gentle exercise of the joint.

Stiffness often depends to some extent on the formation of adhesions around the joint, and good may sometimes be done by giving an anæsthetic and very carefully manipulating the joint by first practising rotation of the humerus on its long axis, and then carrying the elbow in different directions through a limited range. This proceeding, however, should be adopted only when the patient is suffering great inconvenience from stiffness of the joint, and when the articular surfaces appear to have undergone no very extensive alterations in shape. In advanced cases, manipulation will not only be useless, but it will in all probability considerably aggravate the disease.

**Charcot's disease.**—This is less common in the shoulder than in the knee, hip, and elbow, yet well-marked examples are sometimes met with. In its early period the affection is indistinguishable from osteoarthritis, and it is often only when evidence of disease of the nervous system is detected that the true nature of the malady is disclosed. In its later stages the changes in the joint still resemble, though they tend to exceed, those that are met with in the ordinary form of osteo-arthritis. The articular surfaces are extensively altered. The glenoid cavity becomes replaced by a large articular hollow, bounded above and in front by the acromion and coracoid processes, and below, as I have seen it, by a mass of new bone springing from the axillary border of the scapula, and produced apparently by ossification of the long head of the triceps. The head of the humerus disappears, and the upper end of the bone is converted into a large club-shaped mass, which is drawn upwards and forwards as in subcoracoid dislocation. The joint capsule is sometimes, together with the neighbouring

bursæ, distended with fluid. The joint is loose and flail-like, and is felt to grate on movement. Movement, however, causes little or no pain, and it is surprising to see the extent to which the arm can still be used. The shoulder is attacked usually only after other articulations have become involved; and no local treatment likely to be of material service can be recommended.

**Synovial cysts**, presenting the characters of enlarged bursæ, are not rare in connection with the shoulder joint. These cysts deserve attention, from the fact that their communication with the interior of the joint is very likely to escape notice.

**Syphilitic disease** of the shoulder joint is, I think, extremely rare. I have never recognised an example of it. For the diagnosis and treatment of **adhesions** about this joint, resulting from injury and other causes, see pages 226 *et seq.*

Enlargement of the bursa beneath the deltoid muscle is noticed at page 164.

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## CHAPTER XXVI.

### DISEASES OF THE ELBOW.

**The elbow.**—This joint is very subject to disease. It is not only frequently attacked with strumous affections, but is further liable to many forms of inflammation more or less acute. Disease may arise from injury, a fall on the part, a blow, or a wrench, common occurrences in so exposed an articulation. I have seen acute arthritis, rapidly passing on to supuration and destruction of the joint, follow violent exertion in a hard boat-race. **Acute arthritis** is often met with in pyæmia or septicæmia, and occasion-



ally after scarlet fever and typhoid. The symptoms of inflammation of the elbow joint (to offer a general description of them) are: (a) swelling, seen chiefly on the outer side, in the neighbourhood of the head of the radius, and about the tip of the olecranon, so that the joint viewed from behind presents an appearance of increased width, together with a longitudinal depression corresponding to the position of the triceps, and a puffy or fluctuating fulness on either side of the insertion of this muscle. When enlargement is considerable, the whole joint, which is maintained at an angle of about  $140^{\circ}$  (the position of greatest ease), has a fusiform and globular outline. (b) Movement is in some instances lost, but in many it is only slightly impaired; so slightly, indeed, that disease may easily be overlooked. Defect of movement is most apparent in the fact that the joint cannot be completely extended. In many cases of subacute inflammation, pronation and supination are scarcely at all interfered with. (c) Pain is very variable; when disease is acute it may be severe, but in subacute cases pain may be deceptively trivial. (d) Heat is readily detected (so large a part of the joint being subcutaneous) when inflammation is acute, but in mild cases it may be scarcely appreciable. (e) Muscular wasting quickly takes place, and, often in obscure cases, constitutes a valuable evidence of disease. It may almost invariably be detected when inflammation has existed for a fortnight or three weeks and upwards. I have found it distinct in the upper arm in acute disease within ten days. The total absence of muscular wasting in a case of suspected disease of the elbow joint may be taken as strongly suggesting that the joint is not itself affected. The *treatment* must be adapted to each case. In acute inflammation, from whatever cause, the joint should be at once placed on an angular splint, and the patient should be confined



to the horizontal position. The arm should be somewhat raised, and supported on pillows; or, better, should be swung by means of a system of cords attached at four points to the splint and running over a pulley projecting from the wall above, and supporting a weight which just balances the weight of the arm. Thus the degree in which the arm is elevated can be very easily regulated, and by acting on the cords attached to different parts of the splint the limb can be placed in the position most comfortable to the patient. The joint may be covered with an evaporating lotion, or irrigated with iced water allowed to fall drop by drop on lint from a vessel suspended an inch or so above the part. When acute traumatic inflammation is incipient, eight or ten leeches may often be applied with great advantage. I have seen all the symptoms quickly subside after their use. Should suppuration occur—an event that will be indicated by a continuance of severe pain, and high temperature, combined with an increase of swelling, and the occurrence of rigors, or the development of redness and œdema of the integument so that the surface pits on pressure—a small exploratory puncture, under safeguards against septic infection, should be made on the outer aspect of the joint, and if matter escapes a free opening should be made, and drainage be provided. In favourable cases, especially in the young, recovery will take place without loss of movement; but as the joint may be left stiff, it should, during repair, be placed a little within a right angle. When synovitis has been acute and has extended over only a few days, should the elbow remain stiff at the end of two months after all inflammation has subsided, a cautious attempt may be made to restore motion when the patient is under an anæsthetic; but when disease has been prolonged this practice will generally be either useless or mischievous (page 224).

**Strumous disease.** — This affection is very

common, and most frequently sets in between the ages of two and five. But it may occur at any period of childhood or early adult life. Much more rarely it is met with in the old. (*See Senile Struma*, page 121.)

*Symptoms.*—The joint, maintained at an angle of about  $140^{\circ}$ , becomes partially stiff, so that though the fore-arm may admit of almost complete flexion, and though pronation and supination are scarcely or not at all impaired, yet the fore-arm cannot be fully extended. Sometimes stiffness is much more marked. There is swelling in the form of fullness or puffy thickening, most apparent on either side of the triceps at the back, so that the joint looked at from behind presents an aspect, as compared with its fellow, of increased width. In advanced cases the whole joint is enlarged and fusiform, and all the bony landmarks are obscured. Pain is often entirely absent, and is not provoked even by gentle movement. This absence of pain often induces parents, and even perhaps surgeons, to believe that no disease is present. Abnormal heat of the surface may be noticed, but its absence must not be taken for a sign that the joint is not affected. Muscular wasting can almost invariably be detected, especially in the upper arm. Indeed, muscular wasting, swelling, and stiffness are the three symptoms that are most constantly developed, and that may be most safely depended upon as indicating that disease is present.

*Treatment.*—At the earliest moment at which disease is detected the joint should be enclosed in a pair of well-fitting, rectangular leather splints (Fig. 47),\* and supported in a sling. These splints should be constantly worn by night as well as by day. They should be removed only every second or third day, while the

\* These and several other splints illustrated in this work are copied from splints manufactured by W. H. Spratt, New Bond Street, London.

skin is gently sponged, dried, and dusted with violet powder, and should then be at once replaced. I believe it is best not to use any local applications to the joint beneath the splints, for they lead to an undesirable amount of disturbance of the articulation, without doing any material good. If the complete rest secured by the splints is continued for from three to nine months, recovery will in a very large proportion of cases be obtained. Usually at least six months will be required. I have seen a considerable number of

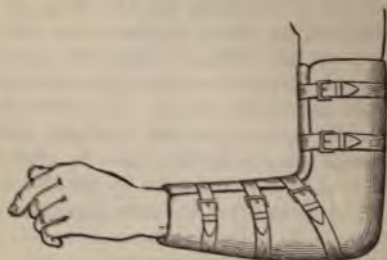


Fig. 47.—Leather Splints for the Elbow Joints.

instances in which, after six months' rest, perfect movement has been regained, and no return of disease has subsequently been observed. When, as so frequently is the case, disease has been allowed to advance for from three to six months or longer, a proportionately extended period of rest will be required. This may amount to a year or even eighteen months; but if this term can be secured a good result will ensue. Sometimes the joint will be stiff (*see* page 114); but in many instances, although the splints have been uninterruptedly worn for as long as a year for the treatment of disease of long standing, free movement has been preserved. The splints should be worn for at least three months after all pain, heat,



and swelling have finally disappeared ; and movement should be only very gradually resumed. Should sup-  
puration occur, matter must be at once antiseptically  
evacuated. If the disease has reached an advanced  
stage, and if sinuses have already formed when the  
case is originally seen, the first point must be to pro-  
vide free drainage ; the second to secure rest by leather  
splints, with openings through which matter may escape.  
Cases thus treated are often seen to undergo rapid  
improvement, so that in a few weeks the sinuses have  
soundly healed. Others are much more tedious, but  
in the majority repair will at length take place. There  
are some instances, however, in which the ends of the  
bones are found to be extensively carious, in which the  
synovial membrane, after undergoing pulpy degenera-  
tion, has become the seat of chronic suppuration, and  
in which the soft parts are traversed by old sinuses.  
Here excision may be performed with advantage. The  
diseased bone may be removed, the affected synovial  
membrane may be carefully traced out and cut away  
with scissors, and sinuses may be opened up. The  
method of operating is described at page 314. The  
result of excision is often highly satisfactory, and an  
arm almost as useful as its fellow is secured. In some  
cases, however, in young children, in whom disease is  
very advanced, the surrounding muscles have under-  
gone such extensive atrophy that the limb is very  
weak and the joint is loose and flail-like for a consi-  
derable time. Unquestionably excision will not be  
called for if treatment by rest is employed early,  
and is efficiently carried out. **Osteo-arthritis** and  
**Charcot's disease** are both met with in the elbow.  
Neither, however, calls for detailed description, for the  
characters they present are very similar to those ob-  
served in such joints as the knee and shoulder (page  
84 *et seq.*).

I have met with four instances of **hæmophilia**



(page 159) involving the elbow. In all, at a time when hæmorrhage was taking place elsewhere, the joint was observed to become suddenly swollen and painful. Enlargement continued for about a fortnight and then gradually subsided. In two of the cases the joint was left much stiffened, and to some extent distorted, in consequence of changes apparently closely resembling those observed in osteo-arthritis. (For treatment, *see* page 163.)

**Syphilitic disease.**—Three cases of syphilitic disease of this joint, in the form of gummatous infiltration of the peri-articular tissues and effusion into the synovial cavity, have come under my notice. Two are related at page 151, and the other example presented features of a similar character. In one of these, a man, aged twenty-three, who had lately returned from active service in Egypt, was suffering with chronic swelling of the left elbow, two well-marked syphilitic nodes, one on the tibia and the other on the clavicle, and a tubercular eruption on the trunk. On examination the joint evidently contained a small amount of fluid, but the enlargement was mainly due to irregular thickening and induration of the sub-synovial tissue, which in some parts presented well-marked, low-crowned tuberos nodules. Under the influence of iodide of sodium (page 157), in twenty-grain doses, three times a day, combined with quinine, the nodes and eruption soon disappeared. The joint affection at the same time disappeared, and the elbow had returned to its normal size in seven weeks.

Cases in which, without presenting symptoms of still existing disease, the elbow joint is found to be stiff, are not very rare. Stiffness may depend either on adhesions outside the joint, following fracture, dislocation, or other injury, or resulting from slight synovitis, either traumatic or due to rheumatism of the joint itself; or it may originate in childhood

from fracture in the neighbourhood of the joint, or partial detachment of some of the epiphysial processes. In such instances the history of the case should be very carefully ascertained, and if the injury or disease, of which an account is forthcoming, has been trivial, and if strumous inflammation can be excluded, an anæsthetic should be given, and a cautious attempt should be made to restore movement. This, which if properly carried out can do no harm, will sometimes prove completely successful. These are some of the cases in which an opening is too often left for the successful practice of so-called bone-setting by irregular practitioners (page 225 *et seq.*).

## CHAPTER XXVII.

### DISEASES OF THE WRIST.

IN children and young adults strumous disease is often met with in this joint. Here, as elsewhere, the affection is apt to be so insidious that, in the majority of cases, it has made considerable advance before its presence is even suspected. Probably, for one case in which the affection is detected and adequately treated in the first month of its existence, there are twenty in which it is allowed to drift on for three or four months, or even longer, before it is recognised. While this is allowed, strumous disease of the wrist, as of the other joints, will maintain its reputation as an intractable condition, often leading to serious impairment of the limb. On the other hand, when an early diagnosis is made, and efficient treatment is brought to bear, these cases, as a very general rule, will end, in periods varying from three to nine months,

in absolute recovery. Many instances of strumous disease of the wrist (as well as of other joints) ensue quickly after injury. But, as injury is the original condition, and as strumous inflammation is developed very insidiously, the transition from the mere traumatic to the strumous type of inflammation is so gradual that it is apt to be overlooked; and I have seen several instances in which, though strumous disease was obviously present, those who had been watching the case from day to day as one of traumatic inflammation, had not been struck with the change that had taken place.

*Symptoms.*—The wrist is dropped, so that the hand forms an angle of about  $120^{\circ}$  or  $130^{\circ}$  with the fore-arm. Swelling is invariably present, so that, as compared with those of the opposite wrist, the various depressions between the tendons are obscured or lost, and not only is the wrist increased in size on measurement, but it exhibits a fulness and smoothness of outline, both on the palmar and dorsal aspects, that even when it is slight is very characteristic. This, together with muscular wasting of the fore-arm, has always seemed to me to afford the earliest and most suggestive evidence of disease, for it is often obvious before any other symptom has become well marked. Pain cannot be relied on. It is often either very slight or entirely absent, not only at first, but for all the earlier period of disease. Movement, when tested by the surgeon, is frequently scarcely interfered with; though if the point is looked to it will be found that there is distinct, though slight, restriction to full extension. Limitation of movement is often earliest disclosed by the manner in which the patient uses the limb. He may be observed to have, as his parents think, a trick of putting his hand in some peculiar position in feeding himself, or in other common movements, the true explanation of which is



that he cannot bend his wrist freely. Muscular wasting, as already indicated, is a symptom to which considerable weight must be attached. It should be looked for in the muscles of the fore-arm, where it is shown either by loss of girth of the limb, or by distinct flabbiness and softness.

*Treatment.*—The fore-arm and hand should be without delay enclosed in leather splints (*see* Fig. 48) and the arm kept in a sling. The patient should not be allowed to use even his fingers. Under this plan, and when means are taken to improve the general health, strumous disease of the wrist will steadily



Fig. 48.—Leather Splints for the treatment of Disease of the Wrist Joint.

recede. Any active symptoms that may have been present, such as pain, heat, and puffy swelling, will subside, and in six or eight weeks it will be obvious that the case is making satisfactory progress. The time during which treatment must be continued will, of course, vary. It should, however, I believe, in no case be less than three months. The best rule is to persevere with the use of the splints for at least three months after all symptoms, including swelling, have completely disappeared; and always to be ready rather to extend than to curtail the period of rest. I have often been struck with the effect of complete rest in the case of the wrist. Perhaps rest is here so efficacious because the splints are able to render it so complete. I have seen several instances in young

adults in whom, although the patient was the subject of tubercular phthisis, the joint affection has undergone complete repair. Should matter form (but this is very rare, unless the disease is already far advanced before the splints are put on) it should be at once evacuated antiseptically, the splints being cut away so that drainage is free. In neglected cases, in which extensive pulpy degeneration has been followed by caries of the carpal bones, suppuration, and the formation of sinuses, improvement will immediately follow the institution of rest; discharge and swelling will diminish, sinuses will close, and a very useful joint will at length be obtained. Many of these instances, however, extend over from six to twelve months. The question of excision is discussed at page 358. I will only say here that even the best results that I have seen have made me believe that every possible means should be taken to escape the necessity of resorting to the operation. I have myself performed it on only two occasions, and, though an average good was obtained, both cases impressed me with the conviction that vastly better results are to be obtained by long rest.

**Osteo-arthritis**, both in its more acute and in its chronic form, is prone to affect the wrist; but this, usually, in combination with like disease in many other articulations. The joint becomes stiff and notably weak. The patient is unable to lift an object of any weight. The wrist is also painful, especially on movement in certain directions, particularly if this is sudden; and the patient often finds that he is thus in danger of dropping whatever he has in his hand. Pronation and supination become limited sooner than flexion and extension, and cracking and creaking can frequently be felt. Swelling is often present in the form of puffy enlargement, especially noticeable on the dorsal aspect of the joint. In some cases the synovial membrane

becomes distended into pouches and ganglionic enlargements, extending for some distance up the fore-arm, so that the disease thus far resembles ordinary ganglionic swelling of the sheaths of the tendons (page 175). The fact that these collections are often in direct communication with the carpal joints must on no account be overlooked, when the question of evacuating their contents is being considered. Usually it is much best to abstain from all active interference with them. But swellings, about which it can be ascertained that they do not communicate with the articulation, if they are so large as to cause inconvenience, may be evacuated (yet great care must be taken to avoid the entrance of septic material through the puncture), and a Martin's indiarubber bandage may be applied to secure uniform pressure. Osteo-arthritis of the wrist is generally intractable. The best *treatment* consists in moderate exercise, warmth, hot douching, and blistering if pain is present. (*See also page 68 et seq.*).

**Urethral arthritis** is occasionally met with. I have notes of one case in a man of twenty-four, in which, after an attack of acute inflammation following gonorrhœa, the wrist was left perfectly stiff, and flexed at an angle of about  $130^{\circ}$ . The muscles of the fore-arm were much wasted. Ether having been given, the joint was manipulated, so that it could be placed in a position of extension on a splint. It was subsequently shampooed, and passive movements were sedulously practised. Posture was improved, and some motion was regained, so that the patient could write, but this was all that I could succeed in doing.

In cases of subacute but persistent rheumatic inflammation of the wrist, the ligaments sometimes become softened and relaxed so that, as the result of this condition, and of effusion, the joint tends to undergo formidable displacement, the carpus and hand together



sliding towards the palmar aspect and the radial border of the limb. In such instances no time should be lost in applying leather splints (Fig. 48). These will not only prevent or arrest a distortion, which if allowed to advance will go far to cripple the limb; but they will, as I have often seen, tend to check the disease, and promote a satisfactory recovery. Besides, they will be of great service in the relief of pain.

Acute inflammation, depending upon a form of blood poisoning, is occasionally met with. It must be treated by rest, evacuation of matter, and drainage. (page 28). **Charcot's disease** and **syphilitic disease**, especially the latter, are rare. I have not met with any illustrations of them.

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## CHAPTER XXVIII.

### DISEASES OF THE SACRO-ILIAC JOINT.

**The sacro-iliac joint.**—Disease of this joint deserves careful study. In the first place because it is often attended with very obscure symptoms, and is therefore apt to be confounded with disease of the spine, the hip, or some other neighbouring part; secondly, because it is of the highest importance that a correct diagnosis should be made early in the case, and that the necessary treatment should be applied without delay. Unless this is done the prospect before the patient is that he will be confined to bed for months, or even for years, with an affection attended with severe suffering, and which shows but very little tendency to repair: or his disease may assume an active form, and lead to a fatal result by suppuration and exhaustion. Fortunately the disease is rare. It is very seldom met with in childhood.

I have had only one example of it under treatment at the Hospital for Sick Children for the past three or four years, while among upwards of a thousand cases that have applied at the Alexandra Hospital, and which have included many different affections (supposed by parents to be hip disease), there have not been more than three or four instances of it. It is most often seen in patients between the ages of fifteen and thirty-five, though it may occur both before and after this period. It is probably, for the most part, scrofulous in its origin, but it is sometimes the result of injury in previously healthy subjects. It has also been met with in the course of pyæmia, and I have seen one instance in which it followed typhoid fever. No doubt it is occasionally produced by extension of disease from adjacent parts of the pelvis, or by the burrowing into the joint of pus from an iliac or psoas abscess. In its usual form the disease is chronic, and the process of inflammation is inactive, tedious, and slow; but sometimes it is from the first acute, and soon passes on to suppuration accompanied with fever, to the destruction of the joint and to the death of the patient by exhaustion. In some cases it becomes complicated with acute tubercular phthisis. The changes that occur in the articulation may involve mainly the synovial membrane, in the form of chronic inflammation and pulpy degeneration resembling that which is met with in the knee and other joints. In other cases the bones appear to be the parts that are first attacked, for they are observed to be already extensively carious while the soft structures, although involved in the inflammatory process, are evidently affected only by the spread of mischief to them. In acute or far-advanced cases the bones are carious, the synovial membrane and cartilage have disappeared, the ligaments have been destroyed by ulceration, and the joint

admits of abnormally free movement. In instances in which recovery takes place, repair is effected by the development of fibrous or sometimes bony ankylosis.

The *symptoms* of this disease are very variable, and so many of them are also the symptoms of disease in neighbouring parts, that a correct diagnosis can be arrived at, not by regarding any particular group as characteristic and always available as conclusive evidence, but by carefully weighing all the signs of disease that are present, and by seeing whether disease of adjacent parts, especially of the lumbar spine and the hip joint, can be excluded. This is always a main point in the study of these cases. It is well also to bear in mind that mischief is much more frequent in the spine and the hip than it is in this joint, so that *primâ facie* the probability is against the presence of sacro-iliac disease. The symptoms, out of the observation of which a correct diagnosis may be formed, are the following :

(a) *Lameness*.—The patient limps, and often complains of a sense of insecurity about his hip and of a want of power, especially when he is going upstairs, or when he attempts to run or to carry a weight.

(b) Pain is usually well marked, and is often extremely severe. In some cases, however, it takes the form merely of a sense of uneasiness and wearing discomfort about the limb. It is felt over the joint itself, where there may be also marked tenderness on pressure ; vaguely about the hip ; in the course of the sciatic nerve at the back of the limb ; or, more rarely, in the course of the anterior crural in front. In some cases pain is complained of only, or chiefly, at the knee, when it is apt, with other symptoms, to suggest the idea that the mischief is in the hip joint. In acute cases pain is increased by coughing or sneezing, and particularly by a sudden jar of the limb, as by a false step.



(c) *Swelling*.—This is sometimes, especially if the patient is stout, quite inappreciable, but generally some fulness and alteration of outline can be detected on the suspected as compared with the opposite side. In the later stages of the disease, when suppuration has occurred, both swelling and fluctuation, or at least a sense of deep-seated elasticity, may be detected.

(d) *Alteration in the position of the limb*.—The thigh usually remains fully extended on the trunk. Often there is no change in the apparent length of the limb, the two malleoli remaining exactly level with each other. Neither is there any eversion. In other cases, however, there is half an inch, or even more, of apparent lengthening, and there is distinct eversion. (The posture of the limb should be compared with that observed in hip disease, page 385.)

(e) There is always *muscular wasting* of the gluteal region and of the rest of the limb; indeed, the limb is usually to a marked extent wasted and powerless.

In investigating a case of suspected sacro-iliac disease, it must be remembered that (a) lameness is of no diagnostic value. It is a symptom here, as in a case in which hip disease is suspected, that shows that something is wrong, but it is entirely wanting in any specific character. (b) Pain is in itself useless for diagnosis until we come to observe by what disturbance it is produced. It becomes strongly suggestive of sacro-iliac disease when it is provoked by pressing the crests of the two iliac bones either apart from each other, or towards each other, so as to put the ligaments of the articulation on the stretch, or so as to press its surfaces into firm mutual contact; especially is this the case if movement of the hip is painless and free, and if no evidence of disease of the lumbar spine can be detected. The presence of (c) tenderness on pressure over the sacro-iliac joint is a symptom of importance.

(d) Swelling, if taken alone, is deceptive. It may, as already said, be entirely absent; while any that is present may be due to abscess burrowing beneath the glutei from disease of the spine. (e) The posture of the limb cannot be in the least depended upon. It is sometimes, as already mentioned, quite unchanged; in other cases it is the same as that which is often present in hip disease.

Having observed all these points, the surgeon should most carefully investigate the conditions of the lumbar spine and of the hip joint. The diagnosis of hip disease is given at page 383 *et seq.* Disease of the lumbar spine may be excluded if the column is found free from angular deformity: and if it is observed to be freely movable. This point is best investigated as the patient lies on his face, and is directed to arch his spine backwards, and then to develop the normal lumbar curve forward. The mobility of the column may also be tested by pressing upon it so as to carry it in the direction of lordosis, or by directing the patient as he lies on his face to raise himself on his elbows without raising his pelvis. The condition of the spine as to its flexibility is much more reliable than many of the current tests, especially such as tapping the spinous processes with the knuckles, or applying a hot sponge. The information derived from these proceedings is, I venture to think, quite unreliable. Now provided the existence of spinal disease and of hip disease has been excluded, and that together with several among the symptoms from (a) to (e) above enumerated, it is observed that pain is increased by pressing the iliac crests together or apart, that there is tenderness over the joint, and especially that there is swelling over the situation of the articulation, we are justified in believing that sacro-iliac disease is present. Thus the diagnosis consists (a) in the detection of symptoms that may depend on disease

either here or in the hip or in the spine, while an examination of these parts enables us to assert that they are healthy; (b) in the detection of symptoms which, while they point directly to disease of the joint, are not explained on the theory that either the spine or the hip is diseased. These are tenderness limited to the joint, swelling confined to its immediate neighbourhood, and pain induced by pressure on the iliac crests. Lastly, the diagnosis between disease of this joint and sciatica can seldom be difficult. Sciatica is rarely met with except in patients beyond the usual age at which the joint disease occurs. Pain in sciatica is felt in the course of the nerve, and is attended with tenderness on pressure at the back of the thigh, but not over the sacro-iliac synchondrosis; pressure on the iliac crests causes no increase of pain; the pain of sciatica is much more variable and intermittent than that of sacro-iliac disease. In sciatica there is no swelling over the sacro-iliac joint.

*Treatment.*—This must consist of the maintenance of long-continued rest in the horizontal position. In other words, it is the same as that which is imperatively demanded in disease of the lumbar spine. If diagnosis is made early, and rest is at once secured, the disease will undoubtedly in a considerable proportion of the cases subside, and recovery will ensue. Rest must, however, be persevered in for from six months to a year. Accessory means are found in repeated blistering, or in the use of the actual cautery over the joint. I have seen the latter remedy highly beneficial in relieving pain and arresting the course of the disease. After the blistering or the use of the cautery, the pelvis may with advantage be enclosed in a well-fitted and well-padded leather or felt case fastening with straps and buckles. Pain is often at once relieved by this appliance. Should matter be detected it ought at once to be evacuated, great care being taken to secure



an antiseptic condition of the wound. There can be little doubt that the tendency of this disease to lead to profuse suppuration and the wide burrowing of pus both under the glutei and within the pelvis has been owing to the fact that, instead of being at once removed by incision and adequate drainage, pus has been allowed to remain confined under tension beneath dense fibrous structures, where it has acted as a constantly increasing source of irritation. When caries of the bones has taken place, the disease has entered on a very intractable stage. With rest and free drainage recovery may still ensue; but the probability is against this. Nor can any operative treatment be depended upon to do material good. Generally, although the surgeon is induced to operate repeatedly, and although on each occasion he removes carious fragments, he fails to secure repair. In cases, however, in which disease is confined to the synovial membrane and other soft structures of the joint, the removal of the affected tissues, by scraping them away with a gouge, together with the free laying open of all the sinuses that are within reach, may be followed by sound healing. In a case of this kind, sent in the course of last year by Dr. Horace Jeafferson, of Wandsworth, to St. Bartholomew's Hospital, and in which, in a woman of thirty-two, several fistulous passages opening on the surface and leading into the sacro-iliac joint were laid open, I found that the synovial membrane was in a condition of pulpy thickening, and was bathed in curdy pus. I freely scraped all the diseased membrane away, so far as I could reach it, and sponged out the joint with a solution of chloride of zinc, forty grains to the ounce. Complete repair occurred, and in the course of four months the patient was discharged with all the wounds closed. She still remains well, and has returned to work as a domestic servant.

## CHAPTER XXIX.

## DISEASES OF THE HIP.

**The hip.**—Among the diseases of the hip joint are some of the gravest maladies that ever present themselves for surgical treatment. The joint is a large one, and is deeply placed beneath the great muscles of the thigh and gluteal region, while it is separated by merely a thin plate of bone, a muscle, and a layer of fascia from the cavity of the pelvis and the important organs therein contained. It is enclosed in dense and unyielding fibrous structures which give rise to a degree of tension that in acute inflammation greatly aggravates the processes of disease. It is subject to the influence of some of the most powerful muscles in the body, which, when they are the seat of contraction resulting from reflex nerve-irritation, induce an amount of intra-articular pressure that leads to highly mischievous results. It is so formed that any material destruction of either of its component bones is liable to be followed by shifting of the articular surfaces upon each other, and a loss of the ball-and-socket mechanism on which it is constructed. Until the last few years several forms of disease of this joint were attended with prolonged suffering, and often ended fatally, while, in cases in which patients survived, the limb was in the majority left in a deformed and crippled state. At the present time, owing to the combined labours of numerous workers, prominent amongst whom have been several distinguished American surgeons, and the establishment of the three great principles of early diagnosis, complete rest, and the evacuation of matter,

as soon as it is detected, affections of this joint have been brought to a large degree under control; the mortality attending them has been greatly reduced, the suffering they formerly involved can now be to a large extent relieved, deformity can be prevented or corrected, and, in many cases, recovery takes place with complete restoration, or with very slight impairment of the functions of the limb. It must, however, be confessed that although experience shows these results are, under favourable circumstances, to be obtained, a large number of cases still end in disaster; for the three principles to which I have alluded are often not brought to bear, and cases that would at once respond to treatment, are allowed to drift on from bad to worse. This is largely due to the fact that parents, starting with preconceived opinions, are unwilling to agree to the necessary means. It is, however, to some extent dependent on the circumstance that some surgeons are imperfectly convinced of the soundness of the methods to which I have referred. This subject is noticed again on page 112. Its importance I hope may justify the repetition of the views I am so anxious to enforce.

**Acute arthritis** of the hip joint is occasionally met with after an injury or after prolonged exertion.

A boy, aged thirteen, while running through long grass, caught his foot, and was thrown down so that his hip was violently wrenched. He was unable to walk, and the same evening he was attacked with severe pain in the joint, and next day his temperature rose to  $103^{\circ}$ . A long splint was applied to the sound side, and a weight of six pounds to the injured limb; but for several days pain continued to be very severe, and was aggravated by the slightest movement. The temperature ranged between  $102^{\circ}$  and  $104^{\circ}$ , and he rapidly lost flesh. Spasmodic contraction of the muscles, producing painful startings of the limb, were at first almost constant. These were relieved when the



weight was increased to nine pounds, and by the hypodermic injection of a sixth of a grain of morphia. The soft parts around the joint were the seat of effusion and brawny induration, and the glands in the groin were enlarged. On the tenth to the twelfth day suppuration seemed about to occur; but no matter could be detected. With continuous rest and weight extension the acute symptoms gradually subsided, and at the end of three months the boy was free from pain; his temperature had been normal for upwards of a fortnight. He ultimately recovered; but the joint was almost absolutely stiff. Acute arthritis occurring in *pyæmia* and other forms of blood poisoning is fortunately rare. It is in the highest degree formidable. Suppuration usually takes place rapidly, and in a few days the joint is completely disorganised. The symptoms are generally well-marked and unequivocal. The patient, in whom generally other evidences of blood poisoning are already developed—inflammation of this joint is very rarely indeed the first lesion to make its appearance—is seized with sudden and severe pain in the joint, and is unable to bear the slightest movement. On examination the limb is found to be maintained in one position, generally it is flexed and abducted, and the joint is stiff. Pressure on the front of the capsule, or behind the trochanter causes pain; and within a few hours there is distinct swelling, best seen anteriorly in the upper part of Scarpa's triangle. Often in the course of two or three days fluctuation is detected, and soon a large collection of matter is present. In other cases, however, mischief is much more insidious. The patient complains of little or no pain at the joint, and effusion and spontaneous dislocation may take place without attracting any attention, until the altered length or position of the limb is noticed, when the acute stage of the original disease has passed off.

*Treatment* is rendered difficult by the general

condition of the patient, which may render it impossible to carry out the necessary local means. If practicable, however, the limb must be placed in a position of extension, and be kept at rest by the application of a weight, or Thomas's splint. When pain is severe, these two methods may be advantageously combined. Should matter be formed, it should be removed with the aspirator or by an incision and drainage. In young subjects, should the joint have become disorganised and the seat of exhausting suppuration, amputation may, when the original disease has subsided, be sometimes performed, in the hope of averting fatal exhaustion. Generally, however, the best chance of recovery will be in prolonged rest, combined with free drainage. In adults amputation is very seldom admissible.

In the course of *typhoid fever* the hip, more commonly, I think, than any other joint, is liable to be attacked with subacute arthritis. The affection sets in usually after the acme of typhoid has been passed, and I have met with it when the patient had reached the sixth week after the commencement of the fever, and was far advanced in convalescence. The disease seldom goes on to suppuration, and is seldom very acute. It is characterised by pain, a fixed condition of the joint, and tenderness on pressure over the capsule. In some instances there has been considerable serous effusion, and dislocation has taken place. There is danger that this accident may be discovered only when the patient has become convalescent, and when it is too late to effect reduction. In any case in which a patient complains of pain in the joint, or in the knee, or in which the limb is observed to be fixed in one position (this is usually flexion and abduction), a careful examination should at once be made, and if symptoms involving the hip are detected weight extension should be applied, and a cradle should be placed over the foot

to prevent pressure by the bed-clothes upon the limb. In the rare event of suppuration taking place the treatment will be the same as that recommended in pyæmic arthritis (page 28).

**Urethral arthritis.**—Under this term gonorrhœal arthritis is included. (*See* page 23.) This affection probably involves the hip more often than any other large joint, except the knee. The affection, which may be developed at any time between four or five days and many weeks after infection, when, indeed, merely a chronic gleet remains, presents itself usually as a subacute but very persistent form of arthritis, attended with the same symptoms that are present in rheumatic inflammation of moderate severity. It often leaves the joint completely fixed by adhesions, some of which are situated within, and some external to, the articular cavity. In some instances, however, the attack is very sudden and acute, and the temperature rises to  $102^{\circ}$  or  $103^{\circ}$ . Suppuration, though it has been met with, is extremely rare. Care must be taken that the real nature of the joint affection is not overlooked; and in any case in which the symptoms of inflammation of a rheumatic type are developed in a male patient who has never before had ordinary rheumatism, it should be ascertained whether any urethral discharge (which, it should be noticed, is not necessarily gonorrhœal) is present. The management of the urethral condition is alluded to at page 26.

The local *treatment* consists in placing the joint at complete rest and applying cold, or when the attack is acute in a strong adult, in the employment of eight or ten leeches, followed by hot fomentations or the use of large poultices frequently renewed. When the active stage of inflammation is past, a succession of blisters about three inches square should be applied. Within the last few years I have repeatedly seen the use of leeches followed by a very material reduction in the degree of



inflammation involving the large joints; and although I have not employed them for acute urethral arthritis, I believe they would prove of service. As to the benefit derived from free blistering, of this there can be no doubt. But in cases in which the inflammatory process becomes obstinate, the actual (benzoline) cautery has a still better effect. It seems advisable to draw prominent attention to these means of treatment, for many surgeons of the present day regard them as antiquated methods, and seldom employ them. Yet, assuredly, a resort to them is often productive of very satisfactory results. When inflammation has entirely subsided, and no pain has been felt in the joint for two or three months, should stiffness remain, the patient should be put fully under ether, and an attempt made to restore movement by manipulation, by first flexing the limb, then adducting it, then abducting it, and lastly extending it. In a strong subject in the prime of life considerable force may be used; but this must always be applied cautiously, and not too suddenly. I have seen the end in view defeated by the use of violence, which had the effect of producing extensive laceration of muscles, and a further exudation of lymph about the joint which became organised, and added to the stiffness that was already present. In many cases manipulation fails to restore motion, for though the joint moves freely at the time, stiffness quickly returns. In such instances daily shampooing and passive movement must be practised, and be continued for several weeks. Should the limb have become firmly fixed in a distorted position, which manipulation fails to correct, the case must be treated as one of ankylosis, and the femur must be divided by Adams's method of osteotomy (page 302).

**Acute arthritis of infants** (page 127).—This affection, which is far from rare in children under the

age of twelve months, is often obscure at its onset. The patient (usually an infant of only a few months old) is observed to keep the limb in a fixed position of more or less flexion, and to cry when lifted, and when the thigh is moved. In a few hours the joint is observed to be painful and swollen. The swelling rapidly increases, so that often within forty-eight hours it has become considerable, and distinct fluctuation can be detected; soon the skin assumes a congested, dusky appearance, and the superficial veins become distended.

*Treatment.*—If, at this stage, matter is evacuated by antiseptic incision, complete recovery may take place, or at most the joint may be left slightly limited in its range of movement. If, on the other hand, the nature of the case is misunderstood (I have known this condition mistaken for rapidly-growing sarcoma of the muscles of the thigh), or if there is any hesitation in opening the abscess that has formed, matter will continue to accumulate, and will soon become widely extravasated among the soft structure of the thigh, the joint will undergo complete disorganisation, the head and neck of the femur and the borders of the acetabulum will be destroyed, and the upper end of the thigh bone will be found to move freely about on the side of the pelvis. Probably death will ensue from exhaustion, and should the patient survive the joint will be loose and flail-like, in the condition observed in the worst examples of congenital dislocation (page 249). It will thus be seen that it is of paramount importance that matter should be let out with the smallest possible delay. I remember an instance in which the parents would not assent to this step. For the next fortnight matter continued to form until the whole upper two-thirds of the thigh and the gluteal region were occupied by, I should think, at least ten ounces of pus. Then the abscess burst, but the patient rapidly sank from exhaustion.

Before this event occurred the upper end of the femur could be moved through a space of about two inches in any direction away from the acetabulum. (For general treatment, *see* page 141.)

**Osteo-arthritis.**—This affection is not only common in the hip joint, but it often assumes a severe form, and leads to very characteristic results. Though met with in rare instances in patients under forty, or even under twenty, it usually sets in after forty-five or fifty. It may attack this joint alone, when it constitutes the old *morbus coxæ senilis*, or monarticular rheumatism, or it may occur in association with similar disease in other articulations. The course it takes, however, and the symptoms to which it gives rise are so similar in the two instances that a single description will suffice.

The affection usually begins slowly and insidiously, with occasional wandering pains at the back of the joint, and down the limb in the course of the sciatic nerve, attended with stiffness of the joint after rest, and a feeling of weakness and fatigue. Many cases that are termed "*sciatica*" are really instances of osteo-arthritis, a fact that should make us careful, when a patient is reported to have *sciatica*, to test the movements of the hip joint. Lameness is soon developed, creaking and cracking on movement may sometimes be noticed, and the muscles of the hip and thigh undergo wasting. These various symptoms, though with frequent exacerbations, and partial intermissions, gradually increase, especially the pain and stiffness. The former is particularly marked at night, the patient being unable to lie on the affected side, or to place himself in a comfortable position on account of a dull wearing and aching sensation about the hip and down the back of the thigh. As the disease advances, and changes occur in the shape of the bones, (page 53 *et seq.*), the joint becomes more and more stiff.



the limb becomes shortened, and everted, and the trochanter is found to be travelling upwards towards the dorsum ilii; the patient is unable to stoop or to put on his boot, and the muscles of the limb undergo steadily-advancing atrophy. At last the hip becomes completely fixed, by interlocking of the new bone formed around the articular borders, and by ossification of the ligaments. Bony ankylosis, as stated at page 60, does not occur. The limb is shortened sometimes to the extent of two inches or more, lameness becomes excessive, in part from shortening, and in part from the inability of the patient to trust his weight to the limb; usually the thigh remains extended on the trunk, and the patient limps on his toe with the foot in a posture of equinus. The bones in the neighbourhood of the joint can be felt to be enlarged and distorted, and the trochanter lies considerably above Nélaton's line. Cases of osteo-arthritis following a fall upon the trochanter are referred to at page 64.



Fig. 49.—Attitude in cross-legged progression.

A remarkable deformity, leading to what Mr. Lucas has described\* under the head of cross-legged progression, occasionally results from osteo-arthritis. (See Fig. 49.) The gait of the patient is due to the fact that both limbs have become fixed in a position of extension combined with adduction.

\* Clin. Soc. Trans., vol. xv.

*Treatment.*—The general treatment of osteo-arthritis is that described at page 69. Gentle exercise is advisable. I have had a man, aged fifty-two, under my care for the last two years, who has often remarked that when he walks three or four miles a day his hip gives him but little trouble, but that it becomes both more stiff and more painful when he takes no exercise upon the limb. When the joint is painful, counter irritation in the form of mustard leaves or small blisters gives marked relief in the majority of instances. Blisters act best when they are used in a series of four or five, one being allowed to heal before the next is applied. Relief may also be obtained by covering the joint, after it has been thoroughly douched with hot water, with a liniment of belladonna or opium. In some instances pain is also relieved by the continuous electric current of six or eight cells, applied daily. In the later stages the disease obstinately resists treatment, and often steadily advances. Little can be done but to employ the means that have been enumerated for the relief of pain, and to advise the patient to walk with a firm stick, so as to avoid throwing much weight on the joint, to advise him, also, to wear a high boot, constructed as lightly as possible, which will compensate for shortening that is often present. The question of endeavouring to restore movement when the joint has become stiff, is one of great importance. Usually no advantage will be obtained by such an attempt; while there is some considerable danger that the force employed may be followed by aggravation of the patient's suffering. In a few instances, however, the range of movement is increased by the detachment and displacement of some of the new bone that has become deposited around the margin of the articulation. The cases in which the proceeding may fairly be tried are those in which, while the patient is not beyond middle

age, and is strong and in good general health, only the hip is affected, and the joint, without being the seat of much pain, is so stiff as to be a source of great inconvenience. The attempt should certainly not be made in old and feeble patients in whom many joints are affected and who are suffering considerable pain.

**Charcot's disease.**—Next to the knee, the hip is, among the large joints, most liable to be attacked with this affection. In some instances the local features of the malady are indistinguishable from those of osteo-arthritis of the ordinary type, and it is only the presence of tabetic symptoms (page 81) that discloses the more formidable nature of the attack. In other instances, however, the changes in the joint are not only associated with symptoms of disease in the central organs of the nervous system, but they transcend, both in their extent, and in the rapidity with which they are developed, anything with which we are familiar in the course of what is usually understood as osteo-arthritis. These cases also differ notably from osteo-arthritis in the absence of pain and stiffness, in the fact that the patient is able to make considerable use of the limb, and in the presence, in some of them, of a large collection of turbid serum forming not a well-defined bursal swelling, as is seen in osteo-arthritis, but an immense fluctuating tumour filling Scarpa's triangle, and presenting also at the outer and back part of the joint.

A typical instance of the acute form of the disease is recorded by Mr. Keetley.\* The patient was a man, aged thirty-four. He was in good health till October, 1880, except that he suffered with pain in the muscles which he attributed to rheumatism and occasional diarrhoea; and, from time to time, with suppuration under a corn beneath the great toe. These symptoms had existed for twelve years. In October, 1880, the great toe was attacked with

\* Clin. Soc. Trans., vol. xv. p. 13.



swelling, and one week afterwards the right hip and thigh swelled enormously. The swelling of the hip greatly subsided in about two months, the joint being left loose and grating, but painless, the limb shortened, and the inguinal glands enlarged. The left hip was similarly attacked in the September of 1881. It passed through the same stages as the right, and in six weeks was also shortened and loose, giving a crunching sound on manipulation. The swelling almost entirely subsided within six weeks of the onset of the attack. On examination Mr. Keetley found that "the trochanter on each side had ascended an inch or more, and when either limb was rotated, moved through so small a circle that there could scarcely be a doubt but that the heads of both femora had been absorbed, at least partially." The ordinary signs of locomotor ataxia to be discovered were inability to stand with the eyes shut and the heels together, loss of patellar reflex, diminution of the reaction of the iris in accommodation, and its loss, so far as the effect of light was concerned. Sensation was blunted on the outer side of both feet, and also in front of the lower half of the left thigh, and perverted in the left foot (he thought his heel was being touched when it was really his toe). There had been no gastric crises, but there had been what might perhaps be termed "intestinal crises," viz., often for a considerable period unaccountable attacks of diarrhœa coming on once a fortnight.

I have never myself met with such a case of joint disease as the foregoing in a patient who did not present symptoms of disease of the nervous system, and however the vexed question of the pathology of the so-called Charcot's disease is ultimately settled, it seems advisable to signalise these remarkable cases by a separate name.

As to *treatment*, there is generally but little to

be done. In those instances in which there is a distinct history of syphilitic infection, especially if this is recent, either mercury or iodide of potassium should be given in combination with quinine or some other tonic. But I know of no other drug that can be given with any prospect of advantage. If large collections of fluid are present around the joint, they may, if the amount is increasing, be aspirated, though it is doubtful whether anything material will be gained by the proceeding, for the fluid will probably soon re-form. Cases have been recorded to show that rest has a marked influence in checking the progress of the disease in acute cases, so far as wearing down and destruction of bone are concerned. It is therefore advisable to keep the patient for a time in bed, and to apply either a Thomas's splint, or moderate weight-extension to the limb.

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## CHAPTER XXX.

### MORBUS COXÆ (MORBUS COXARIUS).

HIP DISEASE, in the natural sense of the word, is as vague a term as "eye disease" or "lung disease" would be. The phrase, however, which has come down to us from former times, is now by common usage limited to that variety of inflammation which is so commonly met with in childhood. Nor, when thus employed, is it superfluous; for the malady in question presents so many special features in respect alike to its symptoms and diagnosis, the course it takes, and the treatment it requires, that it is convenient to describe it under a separate name. But it must be understood that in its pathology the

affection differs in no material respect from disease that is prevalent in the other large joints.

Hip disease consists of an inflammation, generally chronic, and often very insidious, which, arising either in the bones or in the synovial membrane, tends, by continuity of extension, to involve all the structures of the joint. Detected early, and adequately treated, like similar inflammatory processes elsewhere it gradually subsides, and often leaves the joint but little impaired, but when allowed to advance it is soon attended with pain more or less severe, suppuration, and wide burrowing of matter, and considerable deformity. In neglected cases it frequently leads to a fatal termination. The nature of the affection has long been in dispute. While some regard it as the result of neglected local injury in an otherwise healthy individual, others consider it to be generally scrofulous or strumous. In expressing an opinion on this question it is necessary first of all to state in what sense these terms are used. They are here taken to be synonymous, and are employed to indicate a defective condition of the general health, with a tendency to various obstinate local inflammations, of the skin, lymph glands, mucous and synovial membranes, and cancellous bone. In many instances, well-marked tubercle is present (page 97 *et seq.*), while in others the microscopic elements pervading the affected tissues are indistinguishable from the products of simple chronic inflammation. The claim of strumous affections in many cases to stand in a distinct class rests not so much on their pathological anatomy as on their natural history and clinical features, in respect to their intimate alliance with tubercular phthisis, their prevalence in particular families, the occurrence of several of them in the same patient, their development in cases in which there is no history of an injury, or in which local injury may be excluded ;



*e.g.* when hip disease comes on in a patient who has been at rest in a horizontal position for six months for the treatment of caries of the spine; their strong tendency to advance and to relapse. These several characteristics, though they are not exact enough to form the basis of a precise definition, are sufficient to justify the classification of these affections under the special name of struma or scrofula. Taking this view of the subject, I have been led to regard hip disease in many cases as a typical strumous affection.

The tendency to obstinate local inflammation, which is the main clinical characteristic of this class of disease, is much more prevalent in early childhood than in later life. As age advances, it, in the great majority of cases, completely dies out. Many of those who as children display well-marked evidence of struma as above described, entirely recover, and subsequently enjoy perfect health and strength. No doubt, though hip disease must generally be regarded as strumous, it is not rarely met with as the result merely of neglected local injury in individuals of perfectly sound constitutional health.

Hip disease usually originates in the bones; either in the upper end of the femur, or more rarely in the floor of the acetabulum, but it may also begin in the synovial membrane. The old view, that it commenced in the ligamentum teres, or in the articular cartilage, has now been discarded.

In the femur, it commences as inflammation involving (*a*) the cancellous tissue just beneath the cartilage (subchondral caries), or (*b*) the tissue round the ossifying nucleus, or (*c*) the line of junction between the epiphysis and the neck, or, less frequently, (*d*) some portion of the neck within the capsule. In the acetabulum it usually affects the line of junction between the three segments of bone which meet

here, and are connected, during growth, by the Y-shaped cartilage.

In the synovial variety the inflammatory process may be either acute, and attended with early suppu-



Fig. 50.—Separation of the Epiphysial Head of the Femur. (From a preparation in the Museum of St. Bartholomew's Hospital.)

ration going on to the disorganisation of the joint ; or chronic, with a tendency to persistent inflammation, which leads either to the slow formation of matter, or, when the effused lymph is plastic in its character, to firm, fibrous, or, more rarely, bony, ankylosis.

Whatever its starting point, the d                      allowed

to advance, soon involves not only all the soft structures of the joint, but frequently also both the upper end of the femur and the floor of the acetabulum. Owing to the cancellous structure of the bones, the inflammatory process commonly ends in caries, rather than necrosis ; and though sequestra are sometimes found, they are seldom much larger than a nut, and consist of soft fragments easily broken down in the discharge. Cases, however, are not rare in which, as the result of acute inflammation at the junction of the epiphysis with the neck, the whole head of the femur, or what remains of it, becomes detached from the neck (Fig. 50), and is found lying in the interior of an abscess, or in the cavity of the joint. In extensive disease of the acetabulum, sequestra may be found, but they are usually small and friable. Ultimately, the head and neck of the femur, as well as the rim of the acetabulum having been absorbed, the upper end of the femur is displaced upwards and backwards on the dorsum ilii, and accompanying this there is usually an increase of deformity in the direction of flexion and adduction of the limb. In the worst cases the bones become very extensively involved. Chronic inflammation (osteo-myelitis) spreads down to a considerable distance along the medullary tissue of the femur, and leads to wide-spread necrosis. In other instances, the floor of the acetabulum becomes so extensively carious, that the cotyloid cavity is entirely destroyed.

*Diagnosis.*—Although in advanced cases the disease is obvious almost at a glance, in its incipient stage, in which its recognition is so highly important, an accurate diagnosis is often attended with considerable difficulty, and can be arrived at, not by the help of two or three signs that may always be depended upon, but by carefully noticing various combinations of symptoms, none of which is, taken alone, more than



slightly marked. Hence the symptoms cannot be placed in the order of their relative value; and the following is a mere enumeration of them as they would be most conveniently observed in the examination of a patient. They are: Lameness, pain, abnormal posture and alteration of the length of the limb, loss of movement, muscular wasting, tenderness on pressure, swelling about the joint. Each claims a brief notice.

(a) Lameness arises either because pain restrains the patient from the free use of the limb; or because the limb is fixed in some abnormal position which, however, varies with the different stages of the disease. These two causes of lameness often exist together. As, however, each posture produces its peculiar limp, as the limp will vary with the amount of pain, and as various kinds of lameness are often due to affections of the spine or other parts, it will be understood that there is no form that is in the least characteristic of hip disease. The symptom is valuable, as indicating that something is amiss; but, taken alone, it is of no diagnostic value.

(b) Pain varies greatly in its amount. Sometimes, from first to last, it is so slight as to mask the disease. At others it is severe and persistent. The following nerves send twigs to the hip joint: The anterior crural, branches from which usually, but not constantly, pierce the front of the capsule; some from the sciatic and sacral plexus enter behind; and a twig from the obturator reaches the interior through the cotyloid notch. From these various nerves peripheral otheroffsets are supplied to various parts of the limb below. Branches from the anterior crural enter the knee through the front, and from the obturator through the back of the capsule; and other twigs from the obturator end in the inner side of the thigh (in the saphenous plexus); occasionally a branch runs down along the inner side of the leg. This

nerve distribution is alluded to in order to explain how it is that pain may be felt either in the hip joint itself, or in the knee, the inner side of the thigh or the inner aspect of the leg. Its occurrence in parts of the limb below the hip is an example of the reference of pain to the longest peripheries of sensory nerves.

It is well known that when the hip is affected pain may be so entirely limited to the knee as to lead to an oversight as to the real situation of the disease. A case was lately brought from India for treatment in England, in which both knees had been assiduously blistered for pain which in reality depended upon disease of the hip. Pain referred to the inner side of the thigh or the leg is not very commonly met with, yet distinct examples of it are now and then to be seen. It must be remembered that pain is occasionally referred to the knee and other parts of the limb in several affections besides hip disease; *e.g.*, in caries of the lumbar spine, inflammation of the sacro-iliac joint, and abscess in the pelvis, or in Scarpa's triangle; so that this symptom is in itself in no way conclusive as to the presence of disease of the hip. It becomes valuable only when it is found combined with other signs. Sometimes pain is so slight that parents will not believe that the joint is really affected; but its absence must not throw the surgeon off his guard. The severe pain which recurs whenever the patient drops off to sleep, and which leads to the well-known night screams, is produced by the sudden pressure together of the articular surfaces during violent contraction of the muscles round the joint, resulting from reflex irritation (page 260).

(c) *Altered position.*—In the early stages of the disease the limb is flexed, abducted, and rotated outwards. The explanation of this attitude, formerly

so much discussed, is simply that it is the position of greatest ease. It is habitually assumed when we sit at rest, with the lower limbs flexed, the knees apart, and the heels nearly touching. Flexion relaxes the strong ilio-femoral ligament in front of the joint, abduction the ligamentum teres and the upper (ilio-trochanteric) band of the ilio-femoral ligament, and rotation outwards the inner band of the ilio-femoral ligament and the back of the capsule. Later on the powerful adductions draw the limb inwards, and, as the bones are gradually absorbed and the upper end of the femur is drawn upwards and backwards by the muscles as in dorsal dislocation, inversion occurs, so that, in the advanced stage, the limb is flexed, and more or less adducted and rotated inwards. In many cases, however, in which flexion and adduction have been prevented by treatment, as the head and part of the neck of the femur become absorbed, instead of being inverted the limb is rotated outwards, so that it lies in the position observed in fracture of the neck of the femur.

*Compensatory postures.*—As the patient cannot use the limb for progression when it is either flexed and abducted, or flexed and adducted, he adopts certain compensatory postures which enable him to move about. Having lost the power, through stiffness of the hip, of moving the femur on the pelvis, he now moves the femur and pelvis together on the spine. By curving the lumbar spine forwards (lordosis) he turns the pelvis on its transverse horizontal axis, so that the knee points downwards: to compensate for abduction (Fig. 51), he draws up the sound side of the pelvis (Fig. 52), and thus depresses the affected side, with the result of bringing the femur inwards towards the middle line. This movement, attended with curvature of the lumbar spine towards the diseased side, has, by lowering that side



of the pelvis, the incidental effect of producing apparent lengthening of the affected limb (Fig. 52). If the



Fig. 51.—Diagram representing Abduction.



Fig. 52.—Diagram illustrating Apparent Lengthening.

limb is adducted (Fig. 53) the reverse occurs; the patient draws up the pelvis on the affected side, and



Fig. 53.—Diagram showing Adduction.



Fig. 54.—Diagram illustrating Apparent Shortening.

so wheels the limb outwards. This movement is attended with curvature of the lumbar spine with

its concavity towards the diseased side, and incidentally apparent shortening (Fig. 54). Thus apparent lengthening is invariably the equivalent of abduction, and apparent shortening of adduction. Alteration of length occurs only in the direction of shortening. Real lengthening, if not absolutely non-existent, is at all events rare in the highest degree, and its apparent existence on measurement depends on an error in the way in which the measurement has been taken. Real shortening results either from bone absorption, or arrested growth of the limb, and is therefore but little marked in the early stage of the disease.

Real shortening from absorption of the head of the femur and the upper rim of the acetabulum is present only when the disease has considerably advanced. Its amount may be tested either by a careful comparison of the position of the trochanter on the suspected side with that on the sound side, by placing the thumbs on the anterior iliac spines and the fingers on the tops of the trochanters, or by drawing Nélaton's line (from the anterior iliac spine to the most prominent part of the tuber ischii), and observing whether the trochanter touches, though it remains below this line, as is the case normally, or whether, and to what extent, it passes above it; or, as suggested by Mr. Bryant, by drawing lines horizontally outwards from the iliac spines, and measuring the vertical distances from them to the trochanters on the two sides.

(*d*) Loss of movement in the joint is the most invariable, and, taken singly, the most conclusive symptom of hip disease. The method of testing for it is described below. The examination must be at the same time very gentle and very critical, alike as to (*a*) flexion (*b*) and extension, and especially as to (*c*) rotation. Cases of hip disease in which movement is

absolutely unimpaired are, to say the least, extremely rare, and the presence of completely free movement is, taken alone, almost a proof that the joint is sound.

In using this test as to movement it must, however, be borne in mind that the loss of flexion and extension of the thigh upon the trunk is a symptom by no means limited to hip disease. Thus in psoas, or iliac abscess, whether from caries of the spine or any other cause, the thigh can often not be fully extended: in sub-gluteal abscess it cannot be fully flexed; while in some cases of disease of the upper end of the femur, or of the bursa over the trochanter major, attended with inflammation and matting together of the surrounding structures, both flexion and extension are interfered with. It is therefore necessary, when either of these movements is lost, to test the movement of rotation. If when the limb is flexed at an angle of about  $120^{\circ}$  with the trunk, rotation is unimpaired, so that the smooth head of the femur turns freely in the acetabulum, it may be safely concluded that the loss of other movements depends on some condition external to the joint; while if rotation is deficient, it will tend to show that the joint itself is affected. This test as to the various movements of the thigh on the trunk must be very gently carried out. If the examination is roughly made, all the muscles will be contracted to protect the joint, and the contraction will be mistaken for rigidity resulting from disease.

(e) Muscular wasting is a very constant and important symptom. It is most marked as flattening of the glutei and obliteration of the lower fold of the nates; but it can also be detected with less annoyance to patients past early childhood by comparing the measurement round the middle of the thigh with that at the same level of the opposite limb. Instances are not rare in which, in its extent, muscular wasting



simulates that which is met with in the slighter forms of infantile paralysis. It is frequently ascribed to non-use of the limb. It is, however, though in part due to this cause, produced mainly by reflex atrophy, and has its counterpart in the muscular wasting which accompanies disease of all the other principal joints.

(*f*) Swelling.—This is a very variable symptom, and one that is often absent in the early period of the disease. It may be detected either in front of the capsule or behind the trochanter, or in the form of general brawny thickening about the joint. Swelling may also be discovered by grasping the joint between the finger, placed in front of the capsule, and the thumb placed behind the trochanter. Sometimes important evidence may thus be obtained, that the upper end of the femur is extensively involved in the inflammatory process.

During *examination* the patient should be undressed, and lie, not on a soft bed, but on a firm couch, or on some other flat surface, so that the outline of the spine and limb can be clearly seen. It must then be observed whether he can lie flat on his back in the normal position, with the lumbar spine free from forward curvature, and the ham touching the couch; whether the heels correspond, and the anterior iliac spines are level. If, while the knee is down on the couch, the lumbar spine, when the fingers are passed under the loins, is felt to be arched forward, it shows that the thigh is flexed on the pelvis; the extent of this flexion is ascertained by raising the knee till the lumbar spine is straight. If the iliac spine of the suspected side is too low (Fig. 52), it means that the limb is abducted; the amount of this abduction is ascertained by moving the limb outwards until the iliac spines are again level (Fig. 51). If the anterior spine, on the contrary, is too high (Fig. 54), it indicates adduction, the degree of which may be

defined by moving the limb inwards across its fellow, till the pelvis is again square (Fig. 53). Thus the real position of the limb on the trunk will be disclosed. Movement should now be tested by carrying the thigh, with the knee a little bent, slowly and gently in the direction, first of flexion (the knee being carried upwards and inwards across the umbilicus) to the full natural range; secondly it should be extended, also to the full amount, the hand being placed under the loins to see that no lordosis is being produced, then the knee, still flexed, should be gently grasped, and while the fingers are placed on the iliac spine the thigh should be carefully rotated, so as to ascertain whether the femur turns freely in the acetabulum. This test, as already said, is of the highest value, and must be very carefully applied by light and gentle manipulation of the limb, so that neither the child is frightened nor the muscles are roused to a protective contraction. The movements in all directions must be carried to their full range, for in slight cases it is only as their extremes are approached that they are limited and that they afford evidence of disease.

Muscular wasting should now be looked for, either by comparing the two hips, as to flattening and flabbiness of the muscles and the loss of the gluteal fold, or the same information may be gained by taking the circumference of the two thighs at the same level, the corresponding points being obtained by measuring upwards from the superior edge of the two patellæ. Any swelling that exists may be detected either by comparing the two sides or by careful handling. It should especially be noticed whether any thickening is felt when the joint is grasped between the finger and thumb in a direction from before backwards (page 390). Tenderness on pressure, either over the front of the capsule or behind the trochanter, is sometimes a marked symptom, and much depended on by some

surgeons. It should be carefully used, for children often complain from the mere fear of being hurt. Jarring the heel or knee is also a test little to be trusted in any case of doubt. It makes a timid child flinch when the joint is sound, and certainly it often gives no discomfort when the joint is undoubtedly affected.

When all these symptoms have been investigated, the result must be carefully weighed. Generally a conclusion is readily formed, but in some cases this is a matter of no small difficulty, and a diagnosis must be arrived at by piecing together various small shreds of evidence, and in spite of the absence of symptoms which are usually well marked. Thus in one case the only symptoms may be slight and occasional pain, either in the knee or the hip, slight flattening of the glutei, or a flabby condition of the muscles of the thigh, slight impairment of rotation of the femur in the acetabulum, and slight thickening over the front of the capsule. In another, while there is scarcely a trace of pain, slight lordosis, slight apparent lengthening, and slight limitation of extension and rotation can be detected. In another, the only prominent symptom may be muscular wasting, so marked as to suggest infantile paralysis, though a careful examination shows impaired movement, and perhaps tenderness on pressure over either the front or the back joint. An important point of diagnosis is the exclusion of disease elsewhere, especially in the spine and the sacro-iliac joint. Errors are most likely to be made in the direction either of overlooking incipient disease, or of a confusion between hip disease and disease of the spine, attended with psoas or iliac abscess; congenital dislocation of the hip joint, a much more common condition than some believe; infantile paralysis; and the lordosis of rickets, accompanied, as is occasionally the case, with a painful condition of the muscles of the limbs.



If the disease be allowed to progress unchecked, various complications are soon developed.

(a) *Deformity*. — This arises chiefly from muscular action, the result of reflex spasm. The limb at first becomes gradually more flexed and abducted, forms of distortion showing themselves as the child lies in bed, as lordosis, lowering the pelvis on the affected side, and apparent lengthening (page 387). Later on, there is flexion combined with adduction, as the result of which the pelvis on the diseased side is more and more drawn up, so that there is an increase of apparent shortening. By degrees, also, as the bones are absorbed, the trochanter travels upwards and backwards on the ilium, and considerable real shortening is produced.

(b) *Abscess*. — Even in cases that are adequately treated from the first, abscess is frequently sooner or later developed; while in neglected cases suppuration is almost inevitable. Abscesses, though sometimes met with in acute cases in the first few weeks, generally form only when the disease has been many months in progress. They are often cold, and slow in their formation; sometimes, however, they are acute. Many are developed insidiously, but others are preceded by long periods of high temperature, night screaming, and pain on movement. Many form within the joint, and travel outwards, either through the cotyloid notch, to present in Scarpa's triangle, or through the thin part of the capsule at the back of the neck of the femur, to lie beneath the glutei, or they pass into the bursa under the tendon of the psoas, so as to be situated in front of the joint, close beneath Poupert's ligament. Others are from the first outside the capsule, and arise from suppuration about the inflammatory products with which the soft parts have become infiltrated. These may be present at any aspect of the joint, and often track their way for some distance beneath the

tensor fasciæ femoris muscle, or towards the apex of Scarpa's triangle. When the acetabulum is affected, matter may form within the joint, and after producing absorption of the bone, may cause a collection on the inner aspect of the pelvis beneath the obturator fascia, or it may form here when, although diseased, the acetabulum is not yet perforated. Such abscesses, even when small, may sometimes be detected by a finger passed into the bowel, a method of examination which often affords useful information. As they increase, these collections within the pelvis enlarge in the direction of Poupart's ligament, and can be felt when the fingers are pressed downwards above the ligament towards the deeper part of the pelvic cavity. Several cases have come under observation, in which intrapelvic abscesses have formed a connection with the rectum and bladder, so that feces and urine passed through the hip joint were discharged by sinuses leading to the surface. In a case mentioned at page 418, abscess within the pelvis was followed by extensive necrosis of the sacrum.

The detection of an abscess is usually easy. When two or three fingers are placed flat on the surface, and are made to pass over the different aspects of the joint, a circumscribed swelling is found, in which fluctuation can be discovered. When matter is but small in quantity, and is deeply placed, it may be difficult to find it; there may be no fluctuation, and neither œdema of the surface, nor the "tender spot" (often such important symptoms in deep-seated acute abscess) is present. In such a case the presence of deeply-placed resistance, of fulness, or of elasticity, will raise a suspicion of matter, which, as it increases, will soon distinctly declare itself by the development of fluctuation.

(c) *Amyloid disease*.—Formerly, when cases were often left without efficient treatment, and when profuse suppuration was a common result, many patients

became affected with amyloid disease of the internal organs, disclosed by enlargement of the liver, or of the spleen, or of both these organs, or by the presence of albumen in the urine. These patients usually died of dropsy and exhaustion.

This complication must be suspected when discharge is copious and continues for several months, and when the patient is losing colour and flesh. Its occurrence, however, is uncertain; in many cases that I have watched to a fatal termination by suppuration and exhaustion, no amyloid degeneration has occurred. While in other instances, though suppuration has been only recent (three or four months), and not very profuse, amyloid disease has been developed, and has led to the patient's death. The urine should therefore be frequently tested for albumen, and the liver and spleen examined for enlargement, in every instance where suppuration is persistent, and at all free. In the advanced stage of amyloid disease, the patient becomes feeble and wasted, the skin assumes a waxy pallor, there is general dropsy, first apparent on the eyelids and scrotum; often there is diarrhœa, which it may be difficult or impossible to arrest; and sometimes obstinate sickness. The specific gravity of the urine is at first not below normal, but as the affection advances, and the excretion of urea is more and more interfered with, the specific gravity falls to 1012, or even to a much lower point.

The subject of intercurrent *tubercular meningitis* is dealt with on page 116.

*Treatment.*—The first stage of the treatment of hip disease must include absolute rest, and the means by which any abnormal position to which the limb has been brought may be, as far as possible, corrected. The first method described will be that by weight extension. The patient must be placed on a firm horsehair mattress, with a board beneath it



to keep it flat. The pillow should be somewhat wedge-shaped, and large enough only to support the head at a convenient angle. If it is of the usual size the patient will mount his shoulders upon it, so that his trunk is no longer horizontal. In the case of children the mattress should be protected by a piece of waterproof and a draw-sheet. It is absolutely necessary that for a time the patient should be confined to the horizontal position. To ensure this the best plan is to apply an ordinary long splint, such as is used in the treatment of fracture of the femur, and reaching as high as the axilla, to the *opposite* or *sound* limb. A chest band should also be used. This (Fig. 55) consists of a piece of webbing, passing across the front of the chest, and ending in two loops, through which the two arms are passed, and through which is threaded another piece of stout webbing, which runs transversely across the surface of the bed under the child's shoulders, and is fastened at its two ends to the sides of the bedstead. When this is in action the patient's shoulders are kept flat on the bed, so that he can neither sit up nor turn on his side. This chest band does not cause the slightest discomfort. It is not, of course, fixed tightly, and when the child finds that he cannot sit up, he makes no further attempt to do so; and as he lies flat, the band is loose (Fig. 57). Having made these preparations, the surgeon proceeds in the following way:

The weight is applied by means of the "stirrup," made of stout strapping, of which Leslie's is the best kind I know. The stirrup is thus prepared. A piece of strapping is cut, from two to three inches wide, and long enough to extend as an elongated loop from two or three inches below the foot to the middle of the thigh. This is doubled upon itself at its middle, and a piece of wood, shaped like a visiting card, is placed in the cavity of the loop, and fixed by a transverse fold of

strapping. The loop below the foot is thus "set out," so that the sides of the stirrup stand off from, and do not rub the malleoli. Through the centre of this piece of wood a strong cord is run, and carried to the foot of the bed, where it turns over a pulley and supports the weight. The stirrup, thus made, is applied, one end to the inner and the other to the outer side of the limb, and fixed with circular pieces and a bandage. It should reach well above the knee, so that the ligaments

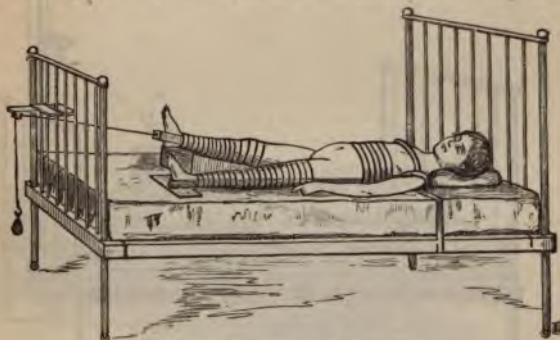


Fig. 55.—Extension in Hip Disease.

of the knee joint are not subjected to injurious traction. I have seen several instances in which, when this precaution has been neglected, the knee has become so "loose" that the leg admitted of considerable hyper-extension on the thigh. The strapping should only be slightly warmed before it is applied, and the weight ought not to be put on for eight or ten hours, otherwise the stirrup, drawn upon before it has become firmly adherent, will slide down, and soon require renewal. A well applied stirrup will last at least three months.

The next step is to substitute the real for the

compensatory position of the limb. If there is lordosis, this means that the limb is flexed on the trunk. To remove it, therefore, the limb must be raised till the lumbar spine is in contact with the mattress (Fig. 55). If the anterior iliac spine on the affected side is lower than the opposite spine, so that there is apparent lengthening, this means that the limb is abducted. The



Fig. 56.—Extension of the Limb in a flexed and abducted Joint.

limb must, therefore, be moved outwards till the spines are again level (Fig. 56). If the iliac spine of the affected side is higher than the other, it means that the limb is adducted, and it must, therefore, be moved inwards across its fellow till the horizontal level of the pelvis has been restored (Fig. 57). Secondly, in whatever position the limb has now been brought to, it must be landed up on pillows, or some other support, on which it may lie at rest. In cases in which deformity is slight, the limb will be only a little raised, and



either slightly abducted or adducted; but when deformity is great the limb must be landed up to a proportionate extent.

Thirdly, the pulley must be adjusted in a line with the long axis of the limb, so that extension is made exactly in this line. When this is the case the effect of the weight is, by tending to draw the head



Fig. 57.—Extension of a Limb in a flexed and adducted position.

of the femur out of the acetabulum, to relieve intra-articular pressure; while if the line of traction does not correspond with the long axis of the thigh, the femur is converted into a lever of the second order, and the acetabulum becomes its fulcrum, with the effect of increasing, instead of relieving, intra-articular pressure. (*See page 265.*) When the limb has been placed at rest under the influence of the weight, other points to be observed are the use of a cradle, to protect the foot from the weight of the bedclothes, and

in cold weather light wraps to keep the foot warm. The amount of weight to be applied varies with the age of the patient. In children under ten it should be from three to four pounds; more is very seldom either required or advisable. It is not to its amount, but to its continuous action, that the weight owes its efficiency in these cases. In young adults six or eight pounds may be required. A caution must be offered against the use of very heavy weights. They are certainly not in the least necessary, and they tend to do harm by the strain they put on the ligamentous structures of the knee, and on other parts of the limb.

It is often surprising to see how quickly this method of weight extension in the line of the thigh will remove deformity. In recent cases it will reduce the limb to its natural position in ten days or a fortnight, while in cases even of long standing it will do so in the course of from two to three months. As the limb comes down it is necessary to readjust the pulley. This is done in the following way: Every three or four days, or at longer intervals, according to the case, while the surgeon holds and slightly draws upon the limb, to imitate the action of the weight, the nurse takes the weight off and removes the landing-stage. The surgeon then brings down the limb, in the direction of extension, as far as it will come without the production of lordosis, and then moves it out when there is abduction, or in when there is adduction, towards the natural position, as far as it will go without tilting the pelvis. When the improvement has thus been ascertained the landing-stage is readjusted to support the limb in the improved posture, and the situation of the pulley is changed so that extension is still made in the long axis of the limb. Similar alterations in the direction of the limb and the line of traction are made from time to time as they can be effected, until at last the limb is placed into its

natural position of full extension, and lies flat on the mattress, and parallel with its fellow. In many cases, however, the form of weight extension just described, although it removes flexion, has no marked effect on either abduction or adduction, so that when the limb has come down into the horizontal position, abduction, showing itself in apparent lengthening, or adduction, showing itself as apparent shortening, will still remain.

Abduction may be disregarded, for it will, if the joint retains any movement, gradually disappear as repair goes on, and this is the usual result; while should ankylosis occur the presence of abduction will be an advantage rather than otherwise, because the apparent lengthening to which it gives rise will, in its degree, compensate for the real shortening which the disease is so likely to produce. I have met with several cases in which the limb, from having become fixed in a posture of abduction, had the appearance of being the same length as its fellow, though measurement proved it to be in reality an inch and a half shorter.

Adduction is much more important, as it has the effect of making the limb apparently, though not in reality, shorter than its fellow. When it is considerable it may induce apparent shortening to the extent of two or three inches. The following plan may be adopted for its removal. While the weight is still applied to the affected side, counter-extension is applied to the sound side by means of a cord running from the lower end of the long splint (on this side), upwards to the head of the bed, where it turns over a pulley and supports a weight of five or six pounds. Thus, while one weight is acting so as to draw the pelvis on the affected side down, the other weight is acting so as to draw the pelvis on the sound side up. This method is very successful. In cases of old disease, in which there has been



extensive absorption of the femur and of the acetabulum, so that the bones have become moulded to each other in a deformed position of the limb, little, of course, can be done; but in all cases in which adduction, though very marked, is not accompanied by any considerable change in the shape of the bones, it may generally be entirely removed by this plan in the course of a few weeks. This is a great advantage, seeing that by the removal of adduction we get rid of shortening, which, though it is only apparent so far as measurement goes, yet has the effect of causing just as much lameness as the same amount of real shortening would induce.

If, when the limb has been brought down to a position of extension, the foot shows a tendency to eversion, this may be corrected in the following way. An outside splint, long enough to reach from the sole to a little above the knee, is furnished with a footpiece and with a cross piece at its lower end, about ten inches long. This splint is applied to the foot and leg, and is at first tilted so that it adapts itself to the outward rotation of the limb, and is supported in this position by two sand bags, one of which is placed under the inner end of the cross piece and the other upon the outer end. It is then gradually rotated by altering the inclination of the cross piece by means of the sand bags, until at last it corresponds to a slightly inverted, instead of an everted, position of the limb, a change of posture which it imparts to the leg and foot, which are fixed to it.

When the disease is of long standing, deformity can be removed only slowly, and six weeks or two months will often be required. In some cases weight extension, however long continued, will fail to rectify the position of the limb. In former years it was the custom to correct deformity by forcible movement when the patient was under chloroform. This proceeding often led to serious mischief. I have

known it in different cases attended with (a) fracture of the femur; (b) rupture of the ilio-psoas, in one instance followed by abscess, pyæmia, and death; (c) displacement of the upper end of the femur on the dorsum ilii; (d) extensive suppuration around the joint; (e) renewal of disease in an acute form. In almost all instances forcible straightening produces severe and long-continued suffering. Such a violent operation calls for unqualified condemnation, and, indeed, there are very few surgeons who now practise it. But in the obstinate cases just alluded to, the following modification of this method, while it is free from objection, is very efficacious. When the child is under chloroform, so that the muscles are relaxed, the limb (handled as if forcible straightening was to be effected) is brought down through two or three degrees (so that the process of extension is started, but nothing more) by manipulation. The weight is now to be re-applied. After this it will be found that the limb will gradually come down. I have frequently found this method succeed, and when too much force is not used no harm results, and no pain is produced. In this way the various forms of screw apparatus formerly



Fig. 53.—Thomas's Splint for Hip Disease (back view).

in use for straightening the hip joint may be entirely dispensed with. This is a great advantage. They were very expensive, and, moreover, they all acted by leverage, and therefore induced intra-articular pressure, with its attendant evil results (page 272).



Fig. 59.—Thomas's Splint for Hip Disease (front view).

Mr. Thomas has invented a splint which has deservedly become popular in the treatment of hip disease (Fig. 59). It is made of iron, and consists of a bar extending from the inferior angle of the scapula to a little above the ankle. It can be easily bent to suit the outline of the trunk and limb, but it is strong enough to retain its shape when applied to the patient. At the upper end it is fitted with a chest piece, made of iron behind, and ending in a leather strap and buckle in front, to fasten round the thorax. It is also fitted with circlets buckling round the lower part of the thigh and leg. It is kept in place with a wide chest band, or flannel roller, and by a bandage passed round it and the limb. When this splint

is employed in cases in which there is deformity, it is bent to the limb, and is then gradually straightened, with the purpose of bringing the limb into its natural position. When deformity has been as far as possible removed, and the disease is quiet,



the patient is mounted on a high boot applied to the opposite limb, and is furnished with crutches of the necessary length (Fig. 59), and is allowed to get about. This splint is a valuable addition to the means of treating hip disease. I, however, prefer weight extension for the purpose of removing deformity, and for use as long as the patient is confined to bed. The action of the weight is continuous, and can be easily regulated; the limb can be re-arranged without disturbance, and when extension is made in the axis of the limb intra-articular pressure is removed. Thomas's splint has no direct effect in removing intra-articular pressure; and when it is used to remove deformity it acts by leverage (page 265), it secures no extension, and I have seen cases in which shortening, the result of absorption of the head of the femur, occurred during—that is, in spite of—its use, and in one the upper end of the femur suddenly became displaced upon the dorsum ilii. Although it may be used so as to remove flexion, it has little or no effect in correcting apparent shortening, and its use is attended (no doubt, in some cases, because it is too tightly bandaged to the limb) with a good deal of muscular wasting. It is not unimportant to mention that if (as is often the case) the splint is too sharply curved at the junction of the gluteal fold with the thigh it may press on the sciatic nerve. In one case brought to the Children's Hospital the pressure of this curve in the splint had led to partial paralysis of the limb, and the same kind of ulcers that are met with in cold weather in cases of infantile paralysis. These unfavourable results, however, are due to the faulty way in which the splint is used rather than to any defect in the splint itself. The splint has seemed to me very serviceable in two phases of the disease: first, in the acute stage, in which the slightest movement, or even a heavy footstep on the floor, gives

pain, and when weight extension, as is sometimes the case, fails to give relief. I have often, under these circumstances, put the patient under chloroform and applied Thomas's splint, and have found that the acute symptoms have very quickly subsided. Secondly, in the later stages, when the time has come to allow the patient to be up, Thomas's splint is certainly very valuable in preventing a return of flexion of the limb. The splint is also very convenient in young children, as it enables the nurse to lift the patient, or to carry him, without disturbance of the limb, from room to room.

Bryant's splint resembles the splint figured in Hamilton's work on fractures, for the treatment of broken thigh in young children, and consists of two long splints, one for each limb, which are fastened together by a cross-bar at their lower end, and by an iron rod arched over the chest and connecting their upper ends. The object of the splint is to keep the patient at complete rest, and to prevent not only flexion, but adduction. Drawbacks to this appliance are that it holds the child in needlessly close confinement; that it cannot be applied in cases of much deformity; that it renders cleanliness difficult; and that, although it keeps the two limbs parallel, it does not prevent the child from drawing up the pelvis on the affected side by sliding the limb under the bandages, and so producing adduction.

The old "shield splint," consisting of leather, gutta-percha, or plaster of Paris, moulded over the joint, is extremely inefficient, for it neither fixes the joint, secures rest for the limb, nor prevents deformity. It is, in all its forms, and for all purposes, entirely superseded by Thomas's splint. The American surgeons have introduced splints intended to secure extension while the child is still allowed to move actively about. These are models of inventive ingenuity, and the object which they are designed to fulfil (that is, of

conducting treatment without confining the patient to the horizontal position) is highly desirable. These splints, however, after having been fully tried, have been very generally discarded by English surgeons, on the grounds that not only is it impossible to maintain extension (that is, to prevent intra-articular pressure) with them, but that they do not secure adequate fixation (that is, rest) of the joint; and that in cases in which they have been worn the disease has continued to advance.

During the treatment by rest muscular wasting may be largely checked by the use of the continuous electric current applied daily; about eight cells should be employed.

As to the period during which treatment must be continued, no precise rule can be laid down. Each case must be separately considered. We must, however, remember, that when once fairly established disease is very seldom cured in less than from nine months to a year; while, as in the majority of instances, the affection has been in progress for several months or even for two or three years before the case comes under notice, the treatment must often be prolonged for a more extended period. Probably the average time occupied in curing this disease is not less than eighteen months, while many examples that ultimately ended very satisfactorily have been treated for as long as three years. Nor must we overlook the strong tendency there is to relapse. The best course is to keep the patient at rest for at least three months after all pain has ceased, and to prolong this period in cases in which the disease has threatened to be severe, or in which the child's health is very delicate, or his family history unfavourable. When the necessary period of rest is thought to have elapsed, if the weight has been used, its amount may be very gradually reduced, at first during the day only, and then also at night;



and when it is found that this change leads neither to pain nor to contraction of the limb, the child may be allowed to be up for a short time daily on crutches, and wearing a high boot on the *sound* side, so that the foot of the affected side does not reach the ground. Thomas's splint should be used if there is any tendency to a return of flexion. The amount of exercise and liberty must be very slowly increased, and great care must be taken that the child does not fall. The weight had better still be worn for several months at night, and the chest band (page 398) should be continued to ensure that the patient sleeps on his back. The case must be carefully watched, and if there is any pain, any night-screaming, any swelling about the joint, increased stiffness, or flinching of the patient on movement, a further period of rest must be insisted on.

**Abscesses.**—*Treatment.* The various situations in which abscesses may present themselves, their diagnosis, and the chronic character which they generally assume, have been already mentioned. (*See* page 393.) It has long been a matter of discussion how these formations should be treated. The old view was that as any active interference was often followed by an immediate accession of acute inflammation of the sac, wide burrowing of matter, pain, fever, and loss of flesh, it was better to leave them to undergo spontaneous discharge, on the ground that this process is attended with very little disturbance, either local or general. The latter observation is doubtless true. It is striking to see how quietly spontaneous evacuation of even large abscesses is effected. The objections to this course, however, are that before the abscess discharges itself it will produce extensive mischief by burrowing among, and breaking down, the muscles and other structures of the limb; and that it leaves a large cavity, lined by the necrotic products of inflammation, the closure of which must be attended with considerable

difficulty and delay. When the aspirator was introduced, it was at first largely used to empty these abscesses, but it was found to be unsatisfactory; for though in cases of residual abscess two or three aspirations were sufficient as a rule, the operation had frequently to be repeated, and the abscesses had probably after all to be opened by incision, while if the pus were thick and curdy the needle became blocked. For the last four years I have adopted the plan of opening these formations, as soon as they are detected, and dressing them with Lister's antiseptic gauze. When the child is under chloroform, and when the limb has been washed with a one-in-twenty solution of carbolic acid, a free incision is made into the abscess cavity. A pair of dressing forceps are introduced to keep the outlet open, and pus is gently pressed out till the cavity is as far as possible empty. A drainage tube just long enough to enter the abscess cavity is then introduced, and the wound is covered with "protective," and dressed with gauze in the ordinary way. If there is likely to be much discharge the dressings are changed next day, and are subsequently renewed, according to circumstances. The results obtained have been highly satisfactory. Although many of the abscesses have been of large size, and deeply seated in the limb, their evacuation has been followed by no increase of suppuration, no rise of temperature, and no constitutional disturbance. In some instances the temperature has been high at the time of the operation; in these it has either quickly fallen, or at least has shown no tendency to rise; but in the great majority of instances in which the abscesses have been of the so-called cold variety, and the child's temperature normal, the thermometer has shown that not the slightest elevation has occurred. Before stating what has been the effect from a local point of view of this method of treatment, reference

must be made to the various forms of abscesses that are met with in the course of hip disease. When we are speculating on the probable result of our interference, it is necessary to bear in mind not only the size and situation of the collection, but the circumstances under which it has been formed. For it is upon these elements of the case, if external influences inducing septic changes can be excluded, that the future progress of the abscess will mainly depend. Now, some abscesses are the result of acute suppurative disease of the joint, which, whatever method is adopted to remove the pus that has already formed, will lead to the production of a fresh supply. In other words, in these cases pus will continue to be formed until the active disease has subsided. Yet the removal of pus in acute inflammation often largely promotes the cessation of suppuration. In a case lately under treatment, in which an abscess was very rapidly increasing in size, when an incision was made and matter let out, suppuration appeared to be suddenly checked, and in a fortnight the abscess had very nearly closed. In a second group matter forms in connection with subacute disease, in which the process of suppuration, though persistent, is languid, so that pus is formed slowly, and in small quantities. In other cases, again, the formation of pus takes place after all active disease has passed by, and when it is a final step in the process of cure, for it involves the old inflammatory products with which the tissues are encumbered, and which, having failed to undergo absorption, must be cast out like a slough or a sequestrum. The abscess which forms round these effete materials, and which, when it bursts or is opened, sweeps them all away, is enabled forthwith to heal, just as an abscess might which had formed during the expulsion of a fragment of dead bone. This form of abscess is a chief member of the class which Sir James Paget has termed residual,



and of which he says: "Most of them are formed where pus, produced long previously, has been wholly or in part retained, and has become dry or in some sort 'obsolete.' But some of them, it is probable, are formed in the thickenings, adhesions, or other lowly-organised products of inflammations long past."\*

We have thus three grades of abscess, so to speak, to bear in mind: (1) Those which occur in the full tide of the acute inflammatory process; (2) those which form when the inflammatory process is sub-acute, or is dying away; (3) those which are developed when all disease has subsided, and when necrotic products of bygone disease have to be cast out. The results of treatment correspond very closely with these different conditions. In the first kind, the mere evacuation of matter already formed, although it may notably check, cannot be expected suddenly to arrest the process of suppuration. Nor does it do so; but what is gained by interference is this: that when the abscess is opened, as the drainage tube provides a passage for the escape of pus as it is formed, the cavity soon contracts to the dimensions of a mere sinus, through which, day by day, each day's secretion quietly flows away; so that, in other words, a sinus for the free escape of matter as it forms is substituted for a rapidly increasing abscess in the limb. The period during which this sinus continues to discharge, and the amount of pus which flows from it, will of course depend upon the amount and persistence of the disease by which it is produced. In the second form, the abscess, evacuated at the operation, remains empty, the sac contracts, and in the course of a fortnight or three weeks the wound appears to be finally healed. Subsequently, however, sometimes only after the lapse of several weeks, or even months, it is found that some re-accumulation is taking

\* "Clin. Lect. and Essays" (1879), p. 309.

place, and at last the wound reopens, or must be opened, and a small quantity of pus escapes, after which final closure takes place; or if this does not occur, a small sinus remains for a few weeks, discharging occasionally, and then, when the last remnants of the original disease have died out, it soundly heals. In the third variety, the emptying of the accumulation is followed by immediate closure, no more matter being formed; and within a fortnight or a month the abscess has completely disappeared, the tissues of the limb have regained their natural condition, and all that remains is the clean and firm scar of the incision. I have seen many of these "residual abscesses," in which, even when they have been of very large size, repair has been absolutely complete within a month. One of the most striking was met with in a boy of ten years old, who had recovered from hip disease of long standing, for eighteen months, when one day he walked with some companions much older than himself from Pimlico to Greenwich and back. Two days later he was seized with great pain in the neighbourhood of his old disease, and ten days later a very large abscess had formed, and was found, when I was asked to see him, presenting both in Scarpa's triangle and also at the back of the joint. His temperature was  $102^{\circ}$ . I opened the swelling both in the front and behind, and evacuated sixteen ounces of pus. His temperature at once fell to normal, and within a month all traces of the abscess had disappeared, and both openings were soundly closed. He had no relapse.

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For my own part, I am very strongly convinced that the best course is to open any abscess that forms

about the hip as soon as it is detected. But it is best in all instances to ensure that the limb has been at perfect rest for at least a week or ten days before operating. If a child has an abscess when first seen, and before the rest-treatment has been entered upon, interference with the abscess should be postponed for a short time till the circulation has become quiet, and the vessels surrounding the area of inflammation have become less engorged.

There is no doubt that, under continuous rest, abscesses, sometimes of large size, holding at least six ounces, may be absorbed. It is, however, probably better that matter should be let out by incision. Sir James Paget in the paper alluded to has recorded instances in which abscess cavities that had been emptied by absorption of their contents, have, either from some disturbance of the general health, over exertion, or other cause, suddenly refilled, and I have seen several similar instances. Healing is more sound and complete when pus has been evacuated.

**Results of hip disease.**—Twenty years ago, the mortality of hip disease in childhood was probably at least thirty per cent.,\* while no small proportion of those who survived became cripples. This high rate of mortality was due either to the exhaustion attending prolonged suffering, and suppuration (often at length combined with amyloid degeneration of the viscera), or to the intercurrent of general tuberculosis, plethia, or tubercular meningitis. Since that period the affection has been closely studied by many surgeons both in England, on the Continent, and in America, and the principles which govern its successful treatment have been ascertained. It has been proved that everything depends on the early recognition of the disease, and the use of long-continued and absolute rest of the

\* Tables in the Report on Hip Disease, *Clin. Soc. Trans.*, vol. xiv. p. 226.



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joint. The introduction (into England from America) of the strapping stirrup for extension, and the invention of Thomas's splint, have furnished adequate methods for securing systematic rest. It has been found that the mere maintenance of the horizontal position, even for one or two years, in good air, has no prejudicial effect on the general health, and that it is only when confinement is combined with pain and suppuration that the health suffers. The old fancy that children kept on their backs would have bed sores, is exploded; and it is now known that no child who is properly nursed ever has bed sores except when he is suffering from extreme exhaustion. The severe suffering which was formerly regarded as inseparable from the disease is so readily prevented by the agency of weight extension, or by Thomas's splint, and other well-known means, that, in the great majority of cases, the patient, from first to last, is never in serious pain, while generally he feels nothing of his joint. Matter, as soon as it is detected, can be evacuated without either pain or constitutional disturbance, so that the mischief which in former years resulted from the accumulation and burrowing of pus, the pain, the prolonged fever, the profuse and persistent discharge, the formation of sinuses, and the development of amyloid degeneration, or some fatal kind of tubercular disease, can be averted. Under these circumstances the mortality of hip disease adequately treated has fallen from about thirty (p. 305) to about five per cent.

As to the condition of the limb. (a) In cases that are detected early and adequately treated perfect recovery, with complete restoration of movement, may often be obtained. In many others the only appreciable defect is a slight limp, due either to loss of free movement, to reflex atrophy of the muscles, or to slightly arrested growth of the limb. Even in instances in which disease has produced faulty position and

suppuration, the treatment by rest continued for a year or for a still longer period, and combined with extension to correct distortion, and with the early evacuation of pus, children often recover without deformity, with almost perfect movement in the joint, and with scarcely a limp. The old view that if once suppuration occurred, the only method of repair was by bony ankylosis, was completely erroneous. I have seen many cases in which, though suppuration has persisted for many months, considerable movement has been retained. (*b*) In some instances, though recovery takes place, growth proves to have been to some degree arrested, so that, as the patient increases in height, the affected limb becomes more and more short in proportion to its fellow. I have met with one case in which this defect in length amounted, when the patient's growth was completed, to as much as four inches, so that even with a high boot, lameness was very considerable. Such a result, however, is very rare. (*c*) Parents among the poor often find it impossible to secure proper treatment for their children, and the average period during which disease has been in progress in patients admitted into their Children's Hospital is about twelve months. In the course of this time the affection has very often advanced to extensive bone absorption and consequent deformity, to suppuration and the burrowing of pus, and to the serious injury of the general health. Even then, however, rest and extension, and the provision for free escape of matter, will, in the majority of instances, lead to recovery; although this may not be effected in less than from twelve months to two years. Ultimately deformity will be removed, though of course the limb will be short, suppuration will cease, and the general health will be restored. In many cases considerable movement will remain; while in others either firm fibrous, or much more rarely bony ankylosis, will occur. The latter is the more favourable result, for when it



has taken place no return of deformity can occur, whereas when ankylosis is only fibrous, not only may deformity recur, but the tissues, subjected to constant strain, are apt to become involved in renewed inflammation. In some of these cases the patients walk with scarcely a limp, even when the union is bony. In others, however, owing to the presence of muscular atrophy and arrested growth, lameness is great. (d) The question of dislocation is important. Cases are occasionally met with, but they are extremely rare, in which the head of the femur, before it has undergone any diminution of size, and while it is still covered with cartilage, becomes dislocated from a normal acetabulum, upwards and backwards on the dorsum ilii. I have notes of a case in which dislocation occurred when hip disease was only of about two months' duration. The dislocation had the characters of an ordinary dorsal dislocation from injury; reduction was effected under chloroform by manipulation. Displacement returned before weight extension had been applied, and reduction was again carried out. It did not subsequently recur. This was probably an instance of acute synovitis, attended with large serous effusion into the joint, and relaxation of the capsule. Generally true dislocation does not take place; but as the result of absorption of the head of the femur, and enlargement upwards and backwards of the acetabulum, the upper end of the thigh bone becomes gradually drawn up by muscular action, so that the trochanter is placed considerably above Nelaton's line. In rare cases the stump-like end of the femur may slip out of the remains of the acetabular cavity, and pass upwards upon the dorsum ilii, with the result that the limb suddenly becomes shortened to the extent of an inch and a half or two inches. I have seen this take place when Thomas's splint was being worn. Such an accident would be prevented by combining weight extension

with the splint. Should it occur, the limb should be carefully extended, under chloroform, and a weight should be subsequently worn. In one instance the head and neck of the femur were absorbed, and the upper end of the bone was found, after recovery, to slide freely on the dorsum ilii through a range of an inch and a half. This condition gave rise to great lameness. **Excision** is discussed at page 317.

**Amputation for hip disease.**—In the opinion of many surgeons at the present day, this expedient ought to be more frequently resorted to than has hitherto been the case, in far advanced instances of hip disease, on the following grounds: (*a*) Recent experience, embodying several material improvements in the operation, has shown that the proceeding is less fatal than it has been supposed to be. (*b*) It is now clearly recognised that when hip disease has reached a certain stage, it is generally useless to look for recovery either from a continuance of rest or from excision. (*c*) It is a familiar observation that children show remarkable rallying power when they are relieved from an exhausting local disease; and it is well known that amyloid degeneration, unless it is of long standing, may completely disappear if suppuration can be arrested. Obviously, however, such an operation as amputation should be resorted to only when recovery appears to be otherwise hopeless. As regards the immediate result of the operation, the cases that have come under my own observation fully accord with the experience of other surgeons. Two years ago I assisted Mr. Savory at an amputation of the hip joint in a boy aged nine, who was rapidly sinking, and was already in a state of great pallor, emaciation, and feebleness. Within a week he had rallied in a very remarkable degree, was bright and cheerful, free from fever, able to take his food, and beginning to gain flesh rapidly. Within three weeks the wound was almost healed. I have myself

performed the operation eleven times. Three patients sank under the amputation, though two afterwards sank from a continuance of amyloid degeneration, combined with the development of mischief in the pelvis. Last November, at St. Bartholomew's Hospital, I removed the limb in the case of a child, aged nine, who had been admitted with hip disease of seven years' duration. She had albuminuria, and numerous sinuses about the joint, through one of which fecal material escaped—an indication that an abscess, connected with extensive disease of the pelvis, had formed a communication with the rectum. I was induced to operate because the child was in constant suffering, and because the only chance of affording her relief consisted in providing free drainage for the matter lodged within the pelvis. Though in an emaciated condition, she bore the operation well, and rallied quickly after it. She improved for a time, but sank two months subsequently. The wound had never quite healed. On post-mortem examination it was found that a large abscess had formed in the pelvis, and that not only the ilium, in the neighbourhood of the acetabulum, but also the sacrum, had undergone necrosis. Both Mr. Savory's case and this afforded evidence that the operation is well borne, even in very advanced conditions of disease. It is, however, highly important to watch the patient very carefully during the period in which rest, drainage, and good nursing are being fully tried, so that the determination to resort to amputation is not hastily formed. Last year I had a boy, aged seven, under my care who had numerous sinuses freely discharging, and who became so reduced that, in consultation, it was concluded that he was too weak to bear the operation. Very shortly after this he began to improve; discharge diminished, his temperature fell from  $103^{\circ}$  to  $99^{\circ}$ , his wounds healed, and in four months he was fat and well. Had the amputation



been performed, and had he recovered, I should have regarded the case as one in which the value of amputation in saving life had been strongly illustrated.

The operation may be performed :

1. When hip disease is complicated with extensive disease of the shaft of the femur, attended with copious and persistent suppuration, and especially if amyloid degeneration is making its appearance.

2. When excision has been performed, but has failed to arrest suppuration, and the general health has given way. Here amputation is much simplified by the previous excision.

3. When the patient, as the result of extensive disease of the joint, is steadily losing ground, and when it is believed that his general health would not enable him to carry out repair after excision.

4. In some instances of free suppuration associated with disease of the pelvis, amputation may be advantageous either by securing free drainage, or by enabling the operator to remove diseased bone that cannot otherwise be reached. The presence, however, of disease of the pelvis which is either extensive or of long standing must generally be regarded as a strong reason against the operation. Indeed, this condition is the main local factor which interferes with recovery. It has certainly been the chief cause of the failures that have come under my own observation.

As the patient is already in an enfeebled condition it is of the utmost importance that the loss of blood should be kept within the narrowest possible limits, and that the operation should be completed in the shortest time that is consistent with its careful performance.

A few weeks ago at St. Bartholomew's Hospital I performed amputation at the hip joint in a girl, aged twelve, for hip disease, attended with profuse

suppuration in the thigh and gluteal region. She was already very exsanguine and weak. I adopted F. Jordan's method (see below). Some delay arose from the presence of partial bony ankylosis at the joint. The external iliac was compressed in the groin. The soft parts proved to be extremely vascular, and oozing was so free that probably three ounces of blood were lost. She sank the same evening. I regret that Davy's lever was not used. I relate the case in order to draw particular attention to the oozing from small vessels that is so dangerous, and so likely to occur in these cases.

There are two methods by which the operation may be performed, the old method by transfixion, and that introduced by Mr. Furneaux Jordan, of Birmingham. If the former is selected it will not be enough to compress the external iliac artery where it passes under the crural arch. Means must also be taken to prevent bleeding from the branches of the internal iliac which are distributed to the posterior flap. This may be done either by digital compression of the abdominal aorta, or by the use of Davy's "lever." The former plan is difficult, except when the patient is very thin. Davy's lever consists of a cylinder about the size of the ring finger, and about eighteen inches in length, with an indiarubber sheath drawn over it to protect the tissues with which it comes into contact. It is introduced with the most scrupulous gentleness into the rectum, and carried up the bowel till its entering end reaches the brim of the pelvis, and lies over the common iliac artery in the interval between the lumbar vertebræ and the psoas muscle. The external end of the lever is then gently elevated, the sphincter ani acting as its fulcrum, with the result that the artery is compressed. Some practice is required in the use of this instrument, and great care is essential. Cases have occurred in which serious injury has been done. I have, however, employed it on several

occasions, and have seen other surgeons use it, with the result that hæmorrhage has been easily and completely controlled. Before it is introduced feces must have been entirely removed from the rectum by an enema, and the bowel should be injected with oil. Mr. Davy's description of the method of employing this instrument is published in the *British Medical Journal*, vol. i. p. 704, 1878.

Mr. Furneaux Jordan's operation is thus performed. When the external iliac is under control in the groin, all the soft parts at the junction of the upper with the middle third of the thigh are divided with a single circular sweep down to the bone; the femur is divided, and the vessels are tied. A vertical incision down to the bone is then made on the outer side of the stump from its inferior extremity to the top of the trochanter, and the remaining part of the femur is removed. This is most easily done by stripping it of the soft parts (by keeping the knife close to its surface) and by strongly abducting it, so that, instead of dissecting around the trochanter and disarticulating from the front and outer aspect, the operator turns the head of the bone outwards; by this means the delay that sometimes attends this part of the proceeding owing to the difficulty of hitting off the exact position of the head is very largely diminished, for as soon as the femur is strongly abducted the head, or what remains of it, comes clearly into view. Furneaux Jordan's operation secures two great advantages: (a) Hæmorrhage is much more easily prevented, for the offsets from the internal iliac which bleed so freely when divided in the transfixion method, in Jordan's method, have already spent themselves as muscular branches, and have thus become unimportant; so that it is enough to compress the external iliac in the groin. No large vessels are cut in the incision along the outer aspect of the stump. (b) While the stump



after the transfixion method is so short that the patient cannot use an artificial limb, but must be content with a crutch; the stump provided by F. Jordan's operation is of such dimensions that an artificial limb can be easily worn. Indeed, it is surprising to see what control the patient has over this appliance when the stump has been made of sufficient length. The objection sometimes advanced to F. Jordan's method that it is less simple and occupies longer time than transfixion has, I think, been overrated. The method undoubtedly requires some practice; but those who have familiarised themselves with it on the dead subject are able to complete it nearly as quickly as the other form of amputation, and certainly less time is expended on the subsequent arrest of hæmorrhage. I have been led to prefer it in the cases in which I have lately amputated for hip disease.

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## CHAPTER XXXI.

### DISEASES OF THE KNEE.

THIS joint, like the hip, presents many important characteristics of its own which must receive due consideration when the diseases to which it is liable and their treatment are being discussed: (*a*) The knee is the largest joint in the body, alike as regards the size of the articular ends of the bones, the extent of its synovial membrane, and the area of its cavity. Any affection of this joint, therefore, especially any form of acute inflammation, is necessarily on a large scale, and is liable to be attended with a corresponding amount of constitutional disturbance. Thus, in acute arthritis a collection of matter to the extent of several ounces may be rapidly developed, and this, bursting through the

synovial membrane and thin capsule may become extravasated far and wide in the intermuscular spaces of the limb. (*b*) Owing to the shape of the articular ends of the two bones by which it is mainly formed, and the way in which the shallow facets of the tibia are constructed to slide upon the rounded condyles of the femur, displacement very readily occurs when the joint is in the posture of semi-flexion, which it at once assumes as the position of greatest ease when it is attacked with disease. In this attitude the tibia is in contact with the femur only over a very limited surface, and is easily drawn backwards towards the popliteal space by the hamstring muscles. (*c*) Whatever be its explanation, the fact is well known to all that the muscles surrounding the knee are, more than those surrounding any other joint, the hip perhaps excepted, liable to be the seat of continuous and severe reflex contraction, whenever inflammatory disease is present. Under these circumstances the joint is subject not only to the injurious results of intra-articular pressure (page 264), but also to the occurrence of irremediable deformity, as the bones of the leg become displaced outwards and backwards into the ham, abducted, and rotated on their long axis outwards. (*d*) The joint is formed by the opposed ends of two long and powerful levers: it is situated in the middle of a bulky limb which contains an elaborate system of powerful muscles, and which is connected with the trunk by means of a joint that allows movement in every direction. It is an articulation, therefore, which it is very difficult to place at complete rest; it is one also to which every movement of the trunk is readily conveyed. (*e*) The ends of the femur and tibia which meet at the knee are those at which growth in length of the lower extremity is mainly effected, and any extensive interference with them, as, for instance, in the operation of excision, is liable to be followed by

arrested development of the limb. All these are circumstances with which the surgeon has to reckon. And they conspire to render treatment of diseases of the knee in many respects more difficult than is the treatment of any other joint. I shall endeavour, as I proceed, to indicate how the various difficulties that offer themselves may best be overcome.

In alluding to the characteristics of the knee I may add that this joint is singularly liable to disease. Some of the affections which it presents are rarely seen in any other articulation; while if we pass in review the different diseases that involve the joints, and note their seats of election, it is the knee in almost every instance that is most prone to be attacked.

*Synovitis* of varying degrees of severity is, on account of the exposed position of this joint and its great liability to cold, and to injury by falls, blows, and sprains, of very common occurrence. The gravity of the case will vary, not only with the degree of violence that has been inflicted, but with the general health and the constitutional peculiarities of the patient. As a rule the prognosis is quite favourable if the necessary treatment is adopted in good time. Suppuration is very rare, repair is usually complete and free movement is regained. If, however, the patient is either gouty, rheumatic, or tuberculous, the original traumatic inflammation may pass on into one of these specific forms. It is especially necessary to remember this in the case of tuberculous patients. Instances are occasionally met with in the knee, and indeed in the other joints also, in which inflammation, due in the first place to a blow or wrench, gradually assumes the character of acute tuberculous disease. The danger is that this alteration in the type and tendencies of the case may escape notice. I have stated that prognosis is good if only appropriate treatment is brought to bear without delay.



But should synovitis be allowed to drift, inflammation of a tedious and destructive form will be developed and, continuing for an indefinite time, will lead to irreparable structural changes in the joint. It is the duty of the surgeon to place the state of the case clearly before the patient. A fortnight devoted to treatment at the outset will often avert the occurrence of changes that would, if they were left to advance, end in the ruin of the joint. Every hospital surgeon has had to perform amputation in cases that originated in an injury, the results of which would never have become serious if only the proper treatment could have been applied without loss of time.

*Symptoms.*—Synovitis is indicated by stiffness, swelling, pain, and heat. When the affection is acute the joint, assuming the position of greatest ease, is flexed at an angle of about  $120^{\circ}$ , and any attempt to move it is attended with an agony of pain. Swelling is considerable, and is observed to follow the outline of the synovial cavity. It obliterates the natural depressions at the sides of the patella and the ligamentum patellæ, and is seen to extend upwards beneath the quadriceps extensor, where, as the capsule is absent, the synovial membrane readily becomes prominently distended. In examining a knee for the purpose of ascertaining whether it contains fluid, the surgeon must be careful to place the patient in the horizontal position, with the limb supported, so that the quadriceps extensor and the other muscles are completely relaxed. Unless this point is attended to even a large amount of fluid may easily escape detection. Fluctuation can be obtained in all the axes of the joint, transversely as well as longitudinally and obliquely. The patella, raised by the fluid collected beneath it, rides on the summit of the swelling, and when pressed upon is felt to dip and strike the condyles of the femur. In cases in which the amount of

fluid in the joint is slight, the riding of the patella and its concussion against the femur can only be detected when the hand grasps the front of the thigh just above the joint, and is made to press the fluid down and concentrate it in the lower half of the joint.\*

Pain is very variable in its amount. When synovitis is of moderate severity pain, when the joint is at rest, may be only very slight; but in acute inflammation, attended with rapid effusion, it is often extremely severe, and is described by the patient as being of a tense, bursting character. Pain, however, cannot be regarded as affording any very reliable index as to the severity of the case, for it varies widely with the sensitiveness of particular patients. In acute synovitis the surface heat over the joint is often considerably raised. Though it may be estimated with the hand, the affected being compared with the sound joint, under similar circumstances as to exposure, the temperature may be much more accurately determined by the use of the surface thermometer, now to be had of all surgical instrument makers.

\* It is often difficult to be certain whether fluid is internal or external to the joint; that is, whether the case we have to deal with is one of effusion into the joint or one of extravasation of blood, forming a large hæmatoma in the periarticular tissue: or, again, whether it is one of arthritis in which suppuration has occurred, or one of periarticular abscess. With care, however, a correct opinion can generally be arrived at. When fluid is within the joint, the synovial cavity is observed to be uniformly distended, and the depressions, both on the inner and the outer aspect of the knee, are obscured. The patella is mounted on the front of the swelling and can be made to dip and strike the condyles; and fluctuation can be obtained in all the axes of the joint. When, on the other hand, the swelling is extra-articular it is limited to some particular part; to the inner side, for instance; and then the outer part of the knee will present a normal outline; or it may lie on the outer side, and leave the inner side unaffected. The patella, instead of being raised, and admitting of being pressed down so as to strike the condyles, lies low, and still rests upon the femur; fluctuation can be obtained only in certain directions, *e.g.* on the inner side of the joint from above downwards; but not from side to side under the patella, or obliquely from the inner to the outer side.

In subacute and chronic synovitis the joint remains stiff and painful, and in some instances the seat of considerable effusion; in other cases little fluid is present, but the synovial membrane is felt to be appreciably thickened, as if by chronic œdema. In slight examples all the symptoms may disappear except pain, slight heat, and recurrence of swelling after exercise. A joint that is cool, painless, and free from swelling in the morning may after exercise contain a considerable amount of fluid, and be hot and stiff towards the evening. When these symptoms are met with, a further period of rest ought to be insisted upon.

*Treatment.*—In synovitis, as in every other inflammatory affection of the knee joint, the only safety lies in placing the joint at once in a condition of complete rest. In these cases it is a grave error to depend merely on a pillow. The limb must be fixed and supported on a firm and accurately adjusted splint. The most convenient apparatus is either a M'Intyre, or an ordinary back splint swung to the top rail of a cradle. Should the joint be considerably flexed an anæsthetic should be given, and the limb should be brought into a position a little short of full extension. This can be done, when the muscles are relaxed, without the use of the slightest force, and the step is a necessary one, for not only is it very difficult from a mechanical point of view to treat an inflamed knee joint satisfactorily, when it is considerably flexed, but when it is in this position dislocation of the tibia backwards is extremely likely to occur. I have met with several cases in which this proceeding was followed with very marked relief. Care must, of course, be taken to avoid tight bandaging above the knee. As soon as the limb has been thus placed at rest it should be covered with an evaporating lotion, or irrigated with iced water (page 11). Leeches should be applied if the patient is strong, the inflammation acute, and the



pain severe. Eight or ten may be used. I have seen very great advantage from their action. If tension is considerable the joint may be aspirated. It is a well-known general fact that mere tension aggravates the inflammatory process, and that immediate relief often follows its removal. It is certainly the case in the instance before us. The proceeding, however, must be carried out with the most scrupulous care. A fine needle should be used, and all possible precautions against the entrance of septic material must be taken. The withdrawal of two or three drachms will often afford marked relief. In case of a violent wrench to the joint, which it is believed has been attended with large hæmorrhage into the synovial cavity, it may perhaps be advisable to withdraw the effused blood by the aspirator at once, on the ground that if it be allowed to remain it may, as it becomes organised, lead to the formation of adhesions which seriously impede movement. Here, as before, the utmost care must be used. Nor must it be forgotten that even a large amount of blood may, though the process is tedious, be completely absorbed.

When there is much muscular spasm, weight extension may be combined with the splint; six to ten pounds being used in adults, and three to six in children. It is very important that the extension should always be made in the long axis of the tibia. (See page 266.) Treated early, in the manner just described, inflammation will usually subside in the course of a few days, and swelling, pain, and heat will gradually disappear. If there is any material delay a series of blisters should be applied, one healing before the next is put on. Then, should swelling still remain, the joint may be covered with the strong mercurial ointment spread on lint, and be strapped with *emplastrum saponis*. In addition, gentle compression with a Martin's elastic bandage,

tightly adjusted, may be employed. The latter is a very useful appliance. In several instances I have seen it produce the absorption of a considerable amount of fluid in the course of a few days. It also affords the patient a comfortable sense of security and support to the joint.

It is often a difficult point to determine when the joint may be used. There is a twofold probability of error upon this question: first, that rest may not be sufficiently prolonged; and secondly, that it may be continued after all necessity for it has passed away. The former is so widely recognised that I need not now insist upon it. The latter calls for more definite notice. Cases are often met with in which long after all active mischief has subsided, the patient is still directed to move about on crutches, and not to bear any weight upon the limb. Frequently the joint has been kept carefully strapped. Such advice appears to partake too much of routine, or of subserviency to a vaguely applied general rule, and to indicate a want of discrimination between one case and another. It also exposes the surgeon to the vexation of finding that his patient has been set right by some irregular practitioner, who, by the rapid cure he has effected by moving the joint, has, in the eyes of the patient and his friends, fully proved his assertion that one of the small bones was out, and that he has put it in. Such instances, ludicrous in their simplicity, but on this account all the more annoying, were much more common only a few years ago than they are at present, yet they still occur with sufficient frequency to justify a special allusion to them. Reliable rules in these cases are the following: As long as the joint is considerably swollen, or as long as swelling that does not soon subside follows movement; as long as the joint is hot, or as long as heat that does not soon pass off, is provoked by movement; and as long as

after the transfixion method is so short that the patient cannot use an artificial limb, but must be content with a crutch; the stump provided by F. Jordan's operation is of such dimensions that an artificial limb can be easily worn. Indeed, it is surprising to see what control the patient has over this appliance when the stump has been made of sufficient length. The objection sometimes advanced to F. Jordan's method that it is less simple and occupies longer time than transfixion has, I think, been overrated. The method undoubtedly requires some practice; but those who have familiarised themselves with it on the dead subject are able to complete it nearly as quickly as the other form of amputation, and certainly less time is expended on the subsequent arrest of hæmorrhage. I have been led to prefer it in the cases in which I have lately amputated for hip disease.

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## CHAPTER XXXI.

### DISEASES OF THE KNEE.

THIS joint, like the hip, presents many important characteristics of its own which must receive due consideration when the diseases to which it is liable and their treatment are being discussed: (*a*) The knee is the largest joint in the body, alike as regards the size of the articular ends of the bones, the extent of its synovial membrane, and the area of its cavity. Any affection of this joint, therefore, especially any form of acute inflammation, is necessarily on a large scale, and is liable to be attended with a corresponding amount of constitutional disturbance. Thus, in acute arthritis a collection of matter to the extent of several ounces may be rapidly developed, and this, bursting through the



synovial membrane and thin capsule may become extravasated far and wide in the intermuscular spaces of the limb. (*b*) Owing to the shape of the articular ends of the two bones by which it is mainly formed, and the way in which the shallow facets of the tibia are constructed to slide upon the rounded condyles of the femur, displacement very readily occurs when the joint is in the posture of semi-flexion, which it at once assumes as the position of greatest ease when it is attacked with disease. In this attitude the tibia is in contact with the femur only over a very limited surface, and is easily drawn backwards towards the popliteal space by the hamstring muscles. (*c*) Whatever be its explanation, the fact is well known to all that the muscles surrounding the knee are, more than those surrounding any other joint, the hip perhaps excepted, liable to be the seat of continuous and severe reflex contraction, whenever inflammatory disease is present. Under these circumstances the joint is subject not only to the injurious results of intra-articular pressure (page 264), but also to the occurrence of irremediable deformity, as the bones of the leg become displaced outwards and backwards into the ham, abducted, and rotated on their long axis outwards. (*d*) The joint is formed by the opposed ends of two long and powerful levers: it is situated in the middle of a bulky limb which contains an elaborate system of powerful muscles, and which is connected with the trunk by means of a joint that allows movement in every direction. It is an articulation, therefore, which it is very difficult to place at complete rest; it is one also to which every movement of the trunk is readily conveyed. (*e*) The ends of the femur and tibia which meet at the knee are those at which growth in length of the lower extremity is mainly effected, and any extensive interference with them, as, for instance, in the operation of excision, is liable to be followed by

arrested development of the limb. All these are circumstances with which the surgeon has to reckon. And they conspire to render treatment of diseases of the knee in many respects more difficult than is the treatment of any other joint. I shall endeavour, as I proceed, to indicate how the various difficulties that offer themselves may best be overcome.

In alluding to the characteristics of the knee I may add that this joint is singularly liable to disease. Some of the affections which it presents are rarely seen in any other articulation; while if we pass in review the different diseases that involve the joints, and note their seats of election, it is the knee in almost every instance that is most prone to be attacked.

*Synovitis* of varying degrees of severity is, on account of the exposed position of this joint and its great liability to cold, and to injury by falls, blows, and sprains, of very common occurrence. The gravity of the case will vary, not only with the degree of violence that has been inflicted, but with the general health and the constitutional peculiarities of the patient. As a rule the prognosis is quite favourable if the necessary treatment is adopted in good time. Suppuration is very rare, repair is usually complete and free movement is regained. If, however, the patient is either gouty, rheumatic, or tuberculous, the original traumatic inflammation may pass on into one of these specific forms. It is especially necessary to remember this in the case of tuberculous patients. Instances are occasionally met with in the knee, and indeed in the other joints also, in which inflammation, due in the first place to a blow or wrench, gradually assumes the character of acute tuberculous disease. The danger is that this alteration in the type and tendencies of the case may escape notice. I have stated that prognosis is good if only appropriate treatment is brought to bear without delay.

But should synovitis be allowed to drift, inflammation of a tedious and destructive form will be developed and, continuing for an indefinite time, will lead to irreparable structural changes in the joint. It is the duty of the surgeon to place the state of the case clearly before the patient. A fortnight devoted to treatment at the outset will often avert the occurrence of changes that would, if they were left to advance, end in the ruin of the joint. Every hospital surgeon has had to perform amputation in cases that originated in an injury, the results of which would never have become serious if only the proper treatment could have been applied without loss of time.

*Symptoms.*—Synovitis is indicated by stiffness, swelling, pain, and heat. When the affection is acute the joint, assuming the position of greatest ease, is flexed at an angle of about  $120^{\circ}$ , and any attempt to move it is attended with an agony of pain. Swelling is considerable, and is observed to follow the outline of the synovial cavity. It obliterates the natural depressions at the sides of the patella and the ligamentum patellæ, and is seen to extend upwards beneath the quadriceps extensor, where, as the capsule is absent, the synovial membrane readily becomes prominently distended. In examining a knee for the purpose of ascertaining whether it contains fluid, the surgeon must be careful to place the patient in the horizontal position, with the limb supported, so that the quadriceps extensor and the other muscles are completely relaxed. Unless this point is attended to even a large amount of fluid may easily escape detection. Fluctuation can be obtained in all the axes of the joint, transversely as well as longitudinally and obliquely. The patella, raised by the fluid collected beneath it, rides on the summit of the swelling, and when pressed upon is felt to dip and strike the condyles of the femur. In cases in which the amount of



fluid in the joint is slight, the riding of the patella and its concussion against the femur can only be detected when the hand grasps the front of the thigh just above the joint, and is made to press the fluid down and concentrate it in the lower half of the joint.\*

Pain is very variable in its amount. When synovitis is of moderate severity pain, when the joint is at rest, may be only very slight; but in acute inflammation, attended with rapid effusion, it is often extremely severe, and is described by the patient as being of a tense, bursting character. Pain, however, cannot be regarded as affording any very reliable index as to the severity of the case, for it varies widely with the sensitiveness of particular patients. In acute synovitis the surface heat over the joint is often considerably raised. Though it may be estimated with the hand, the affected being compared with the sound joint, under similar circumstances as to exposure, the temperature may be much more accurately determined by the use of the surface thermometer, now to be had of all surgical instrument makers.

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In subacute and chronic synovitis the joint remains stiff and painful, and in some instances the seat of considerable effusion; in other cases little fluid is present, but the synovial membrane is felt to be appreciably thickened, as if by chronic œdema. In slight examples all the symptoms may disappear except pain, slight heat, and recurrence of swelling after exercise. A joint that is cool, painless, and free from swelling in the morning may after exercise contain a considerable amount of fluid, and be hot and stiff towards the evening. When these symptoms are met with, a further period of rest ought to be insisted upon.

*Treatment.*—In synovitis, as in every other inflammatory affection of the knee joint, the only safety lies in placing the joint at once in a condition of complete rest. In these cases it is a grave error to depend merely on a pillow. The limb must be fixed and supported on a firm and accurately adjusted splint. The most convenient apparatus is either a M'Intyre, or an ordinary back splint swung to the top rail of a cradle. Should the joint be considerably flexed an anæsthetic should be given, and the limb should be brought into a position a little short of full extension. This can be done, when the muscles are relaxed, without the use of the slightest force, and the step is a necessary one, for not only is it very difficult from a mechanical point of view to treat an inflamed knee joint satisfactorily, when it is considerably flexed, but when it is in this position dislocation of the tibia backwards is extremely likely to occur. I have met with several cases in which this proceeding was followed with very marked relief. Care must, of course, be taken to avoid tight bandaging above the knee. As soon as the limb has been thus placed at rest it should be covered with an evaporating lotion, or irrigated with iced water (page 11). Leeches should be applied if the patient is strong, the inflammation acute, and the

pain severe. Eight or ten may be used. I have seen very great advantage from their action. If tension is considerable the joint may be aspirated. It is a well-known general fact that mere tension aggravates the inflammatory process, and that immediate relief often follows its removal. It is certainly the case in the instance before us. The proceeding, however, must be carried out with the most scrupulous care. A fine needle should be used, and all possible precautions against the entrance of septic material must be taken. The withdrawal of two or three drachms will often afford marked relief. In case of a violent wrench to the joint, which it is believed has been attended with large hæmorrhage into the synovial cavity, it may perhaps be advisable to withdraw the effused blood by the aspirator at once, on the ground that if it be allowed to remain it may, as it becomes organised, lead to the formation of adhesions which seriously impede movement. Here, as before, the utmost care must be used. Nor must it be forgotten that even a large amount of blood may, though the process is tedious, be completely absorbed.

When there is much muscular spasm, weight extension may be combined with the splint; six to ten pounds being used in adults, and three to six in children. It is very important that the extension should always be made in the long axis of the tibia. (See page 266.) Treated early, in the manner just described, inflammation will usually subside in the course of a few days, and swelling, pain, and heat will gradually disappear. If there is any material delay a series of blisters should be applied, one healing before the next is put on. Then, should swelling still remain, the joint may be covered with the strong mercurial ointment spread on lint, and be strapped with *emplastrum saponis*. In addition, gentle compression with a Martin's elastic bandage, not too



tightly adjusted, may be employed. The latter is a very useful appliance. In several instances I have seen it produce the absorption of a considerable amount of fluid in the course of a few days. It also affords the patient a comfortable sense of security and support to the joint.

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there is persistent pain in the joint, *à fortiori* as long as these symptoms are combined, rest, blistering, and pressure, are still called for. On the other hand, when swelling has disappeared, when the surface is free from heat, and when there is no pain at night, or as long as the joint is at rest, movement of a tentative character should be used, and should be continued if it is followed by neither pain, heat, nor swelling, or by only such as soon disappears when the limb is again at rest. Probably pain is the most deceptive symptom. This is often marked and even severe, although the joint is quite fit for active work. It depends partly on trivial adhesions, and in part on the fears of the patient. Pain, however, may be entirely disregarded when it occurs alone and unassociated with either heat or swelling. The patient should be pressed to use the limb; or if the joint is stiff it should be examined under an anæsthetic. It will then probably be found that it can be moved without the exercise of the slightest force, although some slight adhesions are felt to give way. In such instances, if strongly assured that the joint is fit for use, and that he may disregard the pain, the patient will very soon regain the full use of the limb (*see* case Robert D—, at page 230) and pain will entirely disappear.

**Acute suppurative arthritis.**—This may ensue from either a punctured, incised, or lacerated wound, occasionally, perhaps, merely from a severe contusion; or it may arise in the course of epiphysitis (page 127) or some general disease, such as pyæmia, or other form of blood-poisoning. It is also met with after compound fractures extending into the joint, and sometimes from an incautiously performed surgical operation, in the course of which the articular cavity is unintentionally opened, as, for example, when a bursa is punctured whose connection with the joint has been

overlooked, or when the synovial membrane is wounded during the removal of an exostosis, or, as I have known, of an enlarged bursa patellæ. (See page 169.) In misadventures of this kind, if the occurrence is noticed at the time, and the treatment necessary for a wounded joint is at once adopted, no mischief may result; but in many instances the circumstance that the joint has been injured is, in the absence of due care, at first overlooked, and no precautions are taken until acute arthritis has made its appearance.

The *symptoms* of acute suppurative arthritis of the knee are usually of no doubtful interpretation. The inflammatory process is marked by its violence, and the rapidity of its development. There is excessive pain, especially on movement, or even when the bed is jarred by a heavy footstep in the room. Spasm of the surrounding muscles leads to starting and jumping of the limb. Swelling quickly increases, and soon amounts to distension; fluctuation becomes distinct; the skin assumes a suffused tint, and perhaps œdema occurs, so that the surface pits on pressure. These local signs are attended with all the evidence of severe constitutional disturbance. The temperature rises to  $103^{\circ}$  or  $104^{\circ}$ , the patient is restless and distressed, both his pulse and respiration are accelerated, he loses his appetite and power of sleep, and rapidly also loses flesh. Often there are repeated rigors.

*Treatment.*—No time must be lost in the prosecution of the necessary treatment. The joint must be immediately placed on a back splint and swung. If the case is seen before suppuration has occurred, the joint should be assiduously irrigated with iced water (page 11), or ten or twelve leeches should be applied, and should be followed by a large poultice covering the whole knee. General vascular excitement may be reduced by the administration, as Dr. Ringer has advised, of one drop of the tincture of



aconite every quarter or half hour, till a decided effect is produced. Anodynes, of which, perhaps, the best for the occasion are Battley's *liquor opii sedativus*, or the hypodermic injection of morphia (commencing with doses of a quarter of a grain) should be given. The occurrence of suppuration will be indicated by an increase of swelling and pain, by a still further rise of temperature, by an increase in the symptoms of general illness, by redness of the skin, and by an increase in the distinctness of fluctuation, perhaps also by rigors. Rigors, however, are often absent. When these symptoms are observed, the joint should be explored with a hypodermic syringe, in order to ascertain whether matter is already developed. If pus is detected, antiseptic incisions must at once be made, one on the outer and one on the inner side of the joint, and a strip of guttapercha tissue introduced, so that drainage is free. The early evacuation of matter is of great importance. If matter is left it will rapidly increase in quantity, and, distending, and then rupturing the joint capsule, will become extravasated far and wide among the soft structures of the limb. On the other hand, if pus is let out, with the relief of tension, all the active symptoms may subside, and recovery may take place either with the preservation of a considerable degree of useful movement, or with the development of firm bony ankylosis. Where the progress of the case is unfavourable, the discharge remains profuse and the pain severe; and it becomes evident, from the movement of the bones on each other, that the ligaments are destroyed, and that disorganisation of the joint has taken place. At the same time the patient continues without appetite or adequate sleep, he steadily loses flesh and strength, and is subject to profuse and exhausting perspirations. Under these circumstances, the question of performing amputation must be carefully weighed. Unwilling as

the surgeon must be to deprive the patient of his limb, he must bear in mind the danger that prolonged hesitation on his part may cost the patient his life. So long as the patient is not distinctly losing in general condition, it may be right to wait, in the hope that a favourable change may take place; but if from day to day the general health is distinctly failing, and especially if the patient is wasting, further delay is unjustifiable, and the operation ought to be at once performed.

**Acute arthritis of infants** is met with in the knee perhaps more often than in any other joint. The symptoms are clearly marked. In an infant under the age of two years, and frequently only a few weeks old, the joint is found to be stiff, painful, swollen, and hotter than its fellow. In the course of a day or two, or it may be even in a few hours, the articular cavity becomes considerably swollen, and fluctuation, apparently close under the skin, is detected. Generally the child looks pale, ill and distressed, constantly cries, and wastes rapidly. If an incision is made, and drainage established, discharge will gradually diminish, the general condition of the child will improve, and, as I have several times seen, perfect recovery may take place. If, however, matter is allowed to collect, it will soon, after distending the joint, burst through the synovial membrane (probably beneath the quadriceps extensor, where the membrane is unsupported by the addition of a capsule) and will escape into the surrounding structures. All the soft parts, including the ligaments, and then the ends of the bones, will be destroyed, and the joint, should the patient survive, will be left flail-like and, to a great extent, useless. More frequently, however, especially when other joints are similarly affected, and when in them, as in the knee, the requisite incisions are neglected to be made, death will result by exhaustion.

*Treatment.*—In the case of so small a limb, all

that is required by way of mechanical support is a simple back splint, made of tin and padded. Often, indeed, it is best to leave the joint without apparatus, so little does the child move the limb. Free incisions must be made as soon as matter is detected. As repair goes on, care must be used that no contraction ensues. Any tendency to this must be met by placing the limb in a well-fitted back splint, and subsequently, when healing is complete, gentle passive movement may be resorted to.

**Osteo-arthritis.**—Osteo-arthritis (page 51) is so common in the knee that scarcely a day passes in the outpatient room in which sufferers from this malady are not to be found among the applicants for treatment. Sometimes as many as three or four examples of it are presented in the course of a single morning. The disease is somewhat more frequent in women than in men, and usually commences between the ages of forty and fifty. It is often limited to one knee, but cases are also frequent in which both joints are attacked, either at about the same time, or consecutively. The first symptoms are stiffness, especially after rest, and pain. Stiffness usually passes off with movement, but pain, though it is sometimes only slight, is often so severe that the patient is unable to follow any active occupation. Pain may involve the whole articulation, but much more commonly it is felt chiefly at one spot, often over the inner condyle of the femur, and is accompanied by marked tenderness on pressure. Swelling varies considerably in its amount. It may be scarcely appreciable, but often the joint is puffy, or enlarged by effusion into the synovial cavity and periarticular tissues. Sometimes the disease commences with the collection of several ounces of fluid in the joint, so that the outline of the capsule is clearly displayed. When the disease is acute there may be some heat of the surface, but usually the joint is quite cool. The nature of the disease is almost always disclosed by the



presence of grating or cracking, or a sensation as if there were coarse wet sand in the joint, felt when the hands are placed on the knee and the patient flexes and extends the leg upon the thigh. These phenomena may often be heard, as well as felt, during movement of the articulation. Distinct grating and cracking are due to calcification and erosion of the articular cartilage, or to the formation of rough cartilaginous nodules in the synovial fringes, which are rubbed together when the joint is moved. The sensation as if wet sand were being compressed seems to depend on the altered condition of the synovial membrane, the fringes of which become hypertrophied and studded with tufts and slender processes; and these, in different degrees of vascular congestion, convey a feeling of creaking or harsh friction as they slide upon each other. That the sensation is thus produced is, I think, rendered probable by the fact that while the creaking is sometimes distinct and plentiful, it is, in the same case, on other occasions, wholly or almost entirely absent. Indeed it may be present on one day and absent on the next, and I have known it disappear completely a day or two after the joint has been blistered. The general tendency of osteo-arthritis is to advance. The changes described at page 54 *et seq.* are developed, and gradually considerable distortion, and a very crippled condition of the articulations, are produced (Fig 7). In many cases, however, there are periods in which, though the joint is more or less stiff after rest, and though creaking may be felt, the patient complains of no inconvenience, and is able to move actively about upon the limb. In the early stages the affection is, to a great extent, amenable to treatment. Gradually, however, as time goes on, the joint is apt to become more and more stiff, and weak. It also becomes enlarged partly from effusion into its cavity, and partly from bulky thickening of the

synovial membrane and the formation of new bone about the articular margins. (Fig. 60.) Often, too, considerable masses of fibro-cartilage that have under-



Fig. 50.—Advanced osteoarthrititis of the knee joint.

gone calcification can be felt deposited in the synovial membrane. Some of these may be detached, so as to constitute one of the forms of loose bodies in the joints (page 182). In some cases no effusion is at any time to be detected in the joint. In others, effusion occurs to a very large amount, and constitutes one of the varieties of *hydrops articuli* (page 76). In the latter cases the knee becomes extremely weak, so that the patient has great difficulty in going up and down stairs, or in rising from a low seat, and at last even in walking any distance on level ground. Osteoarthrititis of the knee is often associated with disease of a similar kind in other joints, or with antecedent attacks of rheumatism or gout, but it quite as frequently arises independently, and must then be regarded as mainly dependent on textural degeneration followed by, and complicated

with, processes of a low form of inflammation. In some instances, again, it supervenes upon injury, and when this is the case it usually runs a somewhat rapid course, and obstinately resists treatment

*Treatment.*—When the disease is acute, or even when it tends in this direction, the joint should be kept, for the time being, at rest in the horizontal position, and should be sharply blistered. Every day's experience shows that considerable improvement, in respect both to the subsidence of stiffness and swelling and the relief of pain, follows free blistering. Four or five blisters, two or three inches square, should be applied in succession, one being allowed to heal before the next is put on. When the skin has healed, the joint should be well douched for ten minutes with the hottest water the patient can comfortably bear night and morning, and if pain continues, the knee should be wrapped at night in belladonna or opium liniment, sprinkled on lint and covered with oil-silk. If swelling remains, a Martin's elastic bandage may be applied, but it must not be drawn at all tightly round the joint. The patient should now resume the use of the limb, but should take only moderate exercise, and walk with a stick. The joint must be covered with a loose knee cap or flannel bandage to maintain a uniform temperature. In chronic osteo-arthritis similar remedies should be employed. Moderate exercise, hot douching, occasional blistering, and elastic pressure are the best local means within our reach. The general treatment is described at page 68 *et seq.* The management of large effusion into the joint is alluded to at page 78, and the question of endeavouring to restore movement in cases of osteo-arthritis is discussed at page 73.

**Strumous synovitis.**—Very prone to attack the knee, this disease usually commences between the ages of three and six, that is, in the period at which all strumous affections are most prevalent. It is often preceded by a fall, a circumstance that is a comfort to parents, who draw the inference from it that the disease is not constitutional. This conclusion is obviously unsound, for the occurrence of an injury does



not of course exclude the presence of constitutional defect. On the contrary, it is very probable that, had the patient been in good health, the injury would have been soundly repaired. In other words, while the injury is the exciting cause, the defective state of the general health exists as the predisposing cause of the disease that follows the accident. The question, however, is of very slight importance; for, as a matter of fact, the treatment is the same whether the child is in sound or unsound health; and though more time may be required in the latter than in the former class, recovery may in both instances be confidently

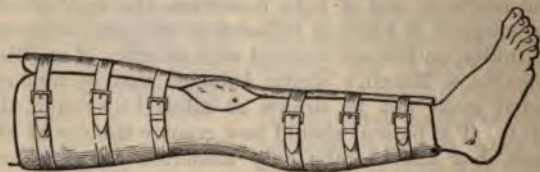


Fig. 61.—Leather splints for diseased knee joints.

anticipated, except in a few cases in which the disease proves to be more than commonly destructive.

*Symptoms.*—These are stiffness, swelling, and soon some muscular wasting, while sometimes pain and surface heat may also be detected. Stiffness is apparent in the fact that though the joint can be flexed, it cannot be fully extended, a defect that is clearly seen when the two limbs are compared. This is a very material piece of evidence. Swelling takes the form of a puffy condition of the joint at the sides of the patella and its ligament, or when it is more considerable, of general fulness and enlargement of the joint, so that its various normal depressions are filled in, and the whole outline is rounded or fusiform. Swelling may also be detected by careful measurement of the two joints at the same level, and when they are in the same position. Muscular wasting, an important

feature, is most marked in the lower third of the thigh, or upper part of the leg. It is sometimes already considerable at the end of two or three weeks; but even if it is slight, and only amounts to a quarter of an inch, or still less, it must not be made light of. Nor must it be forgotten that, compared with the small circumference of the limb in a child, a quarter of an inch represents a marked degree of atrophy. If the disease is allowed to advance, as it inevitably will unless opposed by adequate treatment, the synovial membrane passes into a condition of pulpy degeneration, and can be felt thickened and elastic on pressure. The joint becomes more flexed, and the bones of the leg undergo displacement in two directions. They travel backwards and outwards, so that the fibula can be felt to be much too prominent in the outer part of the popliteal space; and they become rotated on their long axis, so that the foot is everted. When this composite displacement is combined with considerable flexion, the limb is useless for progression, for the toe does not reach the ground, nor can the patient bear any weight upon the joint. In the later stages of disease suppuration frequently occurs.

The *treatment* consists in the persistent use of leather splints, such as are shown in Fig. 61. The statement so often made already respecting these chronic inflammatory processes must be repeated here. If the disease is detected early, and absolute rest is at once enforced, and maintained



Fig. 62.—Thomas's Knee Splint, with patten for sound foot.

for the necessary period, perfect recovery, or recovery with only slight loss of movement, may, in the great majority of cases, be secured. Nothing that I have seen in the last ten years has left any

misgiving on my mind on this subject. In many cases in which children had been lame for three or four weeks, and in which, on examination, the knee was found stiff, painful on extension, swollen, and hotter than its fellow (cases, that is, in which all the usual symptoms of strumous synovitis were present), perfect recovery within from four to six months has taken place. The splints should be worn by night as well as by day, and while any active symptoms remain, the limb should be scrupulously kept in the horizontal posture. Subsequently a Thomas's knee splint (Fig. 62) may be employed if the patient is old enough to manage crutches, and provided that no return of swelling, heat, or stiffness is, on careful watching, to be observed. In this appliance the weight is transmitted through the tuber ischii, and the foot does not reach the ground (Fig. 63). In young children, however, the leather splints (Fig. 61)



Fig. 63. — Thomas's Knee Splint in use.

should be used throughout. If these splints tend, as is sometimes the case, to slip down, the difficulty may be easily overcome by adding to each a very light steel bar or rod, which passes down to the foot, and is fastened to the heel of the boot. In cases in which there is a tendency towards flexion at the



joint, the leather splints may be combined with Thomas's apparatus. The use of these leather splints will effectually prevent displacement of the bones of the leg. This is a highly important point, for it may be fairly said of the great majority of cases, that a knee joint is never past recovery until it has been allowed to get out of shape. In instances of more advanced disease, prolonged rest in leather splints will usually at length secure repair. I have lately seen a boy, aged nine, the history of whose case is briefly as follows: When two years of age he developed strumous synovitis of the left knee. For the next three years he was treated in a variety of ways. One surgeon strongly urged the use of leather splints to secure uninterrupted rest. These were worn for six months. Another, however, now urged the necessity of exercise to maintain the general health, and directed that the child should use the limb. Next, as the disease again increased, a bone-setter was consulted. He stated that a small bone was out, and performed an operation, to put it in. As the result, the joint became hot, considerably flexed, and enlarged; the synovial membrane became thickened, and the bones of the leg underwent displacement backwards and outwards. This, though it was distinct, was fortunately only moderate. When the disease had thus been in progress for three years, leather splints were applied, and constantly worn, and the limb was kept in the horizontal posture. Gradual improvement took place; flexion slowly gave way to extension, and as this change occurred, splints adapted to the improved angle of the limb were applied. Swelling, also, became less. Repair, however, was very tedious; but at the end of four years—yet not till then—the joint had assumed a natural appearance, and was freely movable, and the displacement of the bones of the leg had entirely disappeared. This gradual and spontaneous

disappearance of displacement demands attention. I have met with several examples of it. It may, I think, be regarded as an illustration of the tendency, of which many other instances might be given, of parts, especially during the period of active growth, to return, when the immediate effects of disease or injury have passed off, to the normal type. Two examples may suffice: the spontaneous straightening of limbs deformed by rickets, and the gradual, partial, or complete obliteration of scars; but another clear instance is the modelling of bones after the union of fractures. This tendency in the instance before us is of great importance, and constitutes a material element in the recovery that may be obtained by prolonged rest and mechanical support.

It is usually best, when a case of active disease first comes under observation, not to make any immediate attempt to remove deformity that may be present. The splints should be moulded to the joint in its present position, and it will be found that when rest takes effect, muscular spasm will gradually cease, and the limb will admit of more and more extension until it has become straight. As this alteration advances, splints of a corresponding shape must be applied. Two or three changes may thus be required. The advantage of this method is that it is gentle throughout, and that no intra-articular pressure is induced. (*See* page 258.) The objection to the practice of forcible straightening is stated at page 268.

Another instance to show that by prolonged rest an amount of recovery may be attained which some would be inclined to doubt is the following: Charlotte P., aged five, had strumous disease of both knee joints, of eighteen months' duration, together with extensive ulceration of the skin of the right leg just above the ankle; the joints were flexed at an angle of about  $120^{\circ}$ , and much enlarged from

thickening of the synovial membrane, so that they presented a globular outline; the skin over them was dusky, and the muscles of the thigh were much wasted. Leather splints (Fig. 61) were moulded to the joints in their flexed position, and the child was kept on a sofa and never allowed to put her feet to the ground. Improvement was immediate. Redness of the skin subsided; swelling decreased, so that the splints were too large at the knees, and muscular spasm passed off so that the limbs could be straightened through several degrees. At the end of six weeks, therefore, splints that were smaller opposite the joint, and much straighter, were adjusted. Gradually the knees returned to their proper size, the thickening of the synovial membrane disappeared, the limbs became perfectly straight, and at the end of two years, during the whole of which period the child had been entirely off her feet, the joints had completely recovered, and were freely movable; so that a few months later the only defect to be observed in the limbs was that the muscles were somewhat small and weak. For the last six years the patient has been so well that it would be impossible to tell from the condition of the joints that they had ever been the seat of disease.

In cases of chronic disease, in which the knee has become fixed in a position of flexion, or in which flexion is combined with displacement backwards (provided backward displacement is inconsiderable) the limb may be brought into a straight position by the method of extension and counter-extension described at page 266; the objections to the use of screw splints or of forcible manipulation to secure extension are stated at page 268. When displacement backwards and outwards, combined with flexion, is considerable, it will be found extremely difficult, and in many cases impossible, to correct it, on account of the rigidity of the ligamentous structures at the back of the joint.



This will still be the case even when the hamstring muscles have been divided. In instances of long standing a further difficulty is that the articular ends of the femur and the tibia have undergone an alteration in shape, the front part of the condyles of the femur having become overgrown so as to overhang the tibia; while the upper surface of the tibia has become oblique so as to slant downwards and backwards. Under these circumstances, as soon as extension is attempted the bones in front of the joint come firmly into contact and lock against each other; and if force, either immediate or gradual, is applied, the result is that the head of the tibia slips back into the popliteal space. This alteration of the shape of the articular surfaces may be so great that they fit each other only in the deformed position to which they have been reduced. In these unfortunate cases two courses are open: either the joint may be excised, and the limb thus straightened, or the tibia may be brought into a line with the femur, the displacement of its upper end backwards being disregarded. Of these two methods there is no doubt that excision, if the operation can be safely accomplished, and if firm synostosis can be obtained, yields the best result. But on the other hand, excision is open to many objections. Not only is it formidable as an operation, but it is liable, particularly when performed in young subjects, and when the bones are atrophied, to be followed by arrested growth of the limb and by a recurrence of deformity. Hence it may sometimes be best, when the parts have become sound, and when fibrous union is not very firm, to straighten the limb by using a back splint, working with a screw, by means of which the leg piece can be gradually extended on the thigh piece. Cases are sometimes met with in which, notwithstanding the presence of considerable displacement of the tibia backwards, patients can, provided the

disease has entirely come to an end, walk well on the limb. In carrying out extension by instrumental means, in young subjects, the surgeon must be careful to see that movement is really taking place between the tibia and the femur. I have met with instances in which the part to yield was not the band of connection between the two bones, but the line of junction between the epiphysis and the shaft of the tibia. In such cases the limb has been weak and almost useless.

Should suppuration take place in the course of strumous synovitis matter should at once be evacuated by antiseptic incision, the joint being scrupulously maintained at rest; and as soon as discharge ceases to be considerable, leather splints, provided with an opening for the escape of matter from any sinus that remains, should be applied.

In a large number of instances disease begins not in the synovial membrane, but in the articular end of either the femur or the tibia, in the form of epiphysitis (page 125). In these cases—the symptoms and course of which are described at page 138—the limb must be kept at absolute rest, in the hope that the affection of the bone may subside before the joint has become involved. Should suppuration occur matter must, as soon as it is detected, be let out, and free drainage must be provided. In the course of 1885 a boy, aged five, was admitted into the hospital with considerable swelling over the head of the tibia, attended with pain and great tenderness on pressure, together with heat of the surface; and on examination matter was detected. As soon as the limb had been placed on a back splint an incision was made, and a drachm and a half of pus was let out. A probe passed through the wound entered a cavity three-quarters of an inch deep in the head of the bone. Discharge continued for three weeks, and then ceased; swelling subsided, and the boy left the hospital well at

the end of six weeks. I believe had matter been allowed to collect it would probably have made its way into, and have produced destructive disease of, the joint.

For an account of other affections of the knee, the reader should consult the general index, under this joint.

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## CHAPTER XXXII.

### DISEASES OF THE ANKLE.

**Strumous disease.**—Although the ankle joint lies close beneath the skin, so that it is readily accessible to examination, there are many instances in which it is by no means easy to avoid falling into an error of diagnosis respecting its real condition. At first sight the evidence that it is in a state of advanced disease may seem obvious, and yet the joint may be perfectly sound; and I have witnessed more than one instance in which Syme's amputation has been performed under the belief that the joint was disorganised, but in which it has proved that the disease was situated entirely in some of the surrounding parts. It is therefore necessary to consider the question of diagnosis with some care.

Disease may commence either in the synovial membrane, as is frequently the case, or in one of the bones that lie in the immediate neighbourhood: the lower end of the tibia or perhaps the fibula, in the astragalus, or the os calcis. The symptoms of synovial disease are swelling, limping, muscular wasting of the leg, stiffness of the joint, heat of the surface, pain, tenderness. I have endeavoured to place these different signs in the order of their relative value.



they vary, however, so much in different cases that each one must be considered important and should be carefully estimated. The beginner will do well to remember that here, as well as in the case of the hip joint, he is likely to fall into serious error unless he proceeds with caution.

(a) Swelling is always an early and a distinct symptom, taking the form of puffy fulness, to be detected in front, where it fills out all the natural depressions and masks the course of the extensor tendons; at the sides around the malleoli; and at the back, where it produces enlargement on either side of the tendo Achillis, and gives the joint an appearance of increased width. Swelling in this last situation is a symptom which should never be overlooked. It is often well marked when swelling elsewhere is very slight. (b) Limping may be the first symptom observed by the parents, but it is sometimes striking to see how well a child will walk even though strumous synovitis has already made considerable progress. (c) Wasting involving the muscles of the calf takes place early, and is often very marked. Even when the limb is not distinctly smaller on measurement, the muscles can be felt to be flabby and less firm than those of the opposite leg. (d) Stiffness of the joint is usually present when full flexion and full extension are approached, but it is important to notice that the patient will often allow the joint to be moved, and will often, indeed, move it himself, through all its middle range with unrestricted freedom. It is only when the extremes are approached that the impairment is detected. (e) Heat of the surface is an important symptom when it is present, but there are so many instances in which it is wanting that its absence must not be depended on as any indication that there is no disease. The same must be said of pain and tenderness. (f) Pain, though

it is present in the more acute cases, is often absent, so that parents cannot persuade themselves that the condition of the joint is serious; and even a surgeon, who places pain before swelling and muscular wasting as a test symptom, will probably fall into error. (*g*) Tenderness may also be present, but frequently it is so entirely absent that it must not be trusted. On another ground it is a symptom to be very carefully estimated, for rough pressure may give pain in a healthy joint, which may be easily mistaken for the evidence of disease.

*Diagnosis.*—The conditions with which disease of the ankle joint is liable to be confused are disease (1) of the lower end of the tibia, (2) of the tarsus, (3) of the synovial sheaths of the surrounding tendons. The recognition of the exact seat of mischief is not material while disease is still incipient, for the treatment is the same, and consists of perfect rest, secured by means presently to be described. Its importance arises when operative interference has to be considered, and the question is whether it is the end of the tibia, the tarsus, or the joint itself that is to be attacked. In obscure cases neither the situation of swelling nor the position of sinuses can be depended upon. The only evidence that is reliable is that which is derived from the direction which a probe or a director takes when it is carefully used. The patient should be under chloroform, so that a thorough examination can be made. If any doubt whether or not the instrument enters the joint remains, the surgeon should proceed with great caution until, by an exploratory incision, this point has been set at rest. But some guidance may often be obtained by noticing that, though at some parts swelling seems to involve the joint, in other parts the joint preserves its natural outline. Swelling may *e.g.* be well marked in front and on the outer side, but absent from the inner part of the joint.

This may strongly suggest that the articulation itself is not affected. So far as I have observed, the joint is not rarely sound when to external appearance it is itself diseased.

The following cases may illustrate this point. A child, aged three, had a sinus of five months' duration on the front of the foot opposite the articulation between the tibia and the astragalus. The surrounding soft parts were red and considerably swollen, and the swelling extended backward around the malleoli. There was considerable discharge. The surgeon who was treating the patient, believing that



Fig. 64.—Leather Splint for Disease of the Ankle Joint.

the ankle joint was incurably diseased, proceeded to perform Syme's amputation. On making the anterior incision into the joint he found that the articulation itself was perfectly healthy, and that the disease consisted merely of necrosis of the head of the astragalus, with the formation of a small sequestrum that might have been very easily removed. In a second instance Syme's amputation was performed for disease limited to the os calcis. Had this bone been carefully dissected out, the foot might, if we may judge by other cases, have been preserved.

The *treatment* of strumous disease of the ankle joint consists, in the early stage, of applying a pair of carefully moulded leather splints (Fig. 64), and



not allowing the patient to put the foot to the ground. In moulding the splints care should be taken to keep the foot at a right angle with the leg. If the foot is put up at a more open angle, and if any stiffness should remain, the heel cannot be brought to the ground, and, as I have twice seen, it may be necessary to divide the tendo Achillis and bring the heel down, as in ordinary equinus. In one instance in which the extremely rare event of bony ankylosis of the ankle joint (after prolonged suppuration) occurred, and in which the foot became fixed at an angle of  $120^{\circ}$ , the patient walked with great insecurity and difficulty, and would, I think, have had a more useful limb had Syme's amputation been performed. The splints should be constantly worn by night as well as by day. Incipient cases (those in which the disease has existed for not more than a month or six weeks) may thus be cured in six months, if the patient is well fed, takes tonics, and is in good air. In instances of longer standing nine months or even a year may be required. But the result is not doubtful. Perfectly free movement will usually be regained, and the joint will escape all serious injury. If suppuration occurs matter must be at once carefully evacuated, and a piece of guttapercha tissue used to secure drainage. In the convalescent stage, and when the joint is free from swelling, the patient (if he is at any age above six or seven) may be allowed to go about with a Thomas's knee splint and crutches (page 442), but he should still constantly wear the leather splints for the ankle. In cases in which disease begins in the lower end of the tibia (epiphysitis), the treatment given at page 139 must be adopted. This will ensure, in a very large majority of instances, that the joint does not become involved. When either the astragalus or the os calcis is the seat of inflammatory disease, rest secured by leather splints will usually tend towards

repair and the safety of the joint; but when sup-  
puration has already occurred and the disease con-  
tinues to advance, the affected bone may be dissected  
out. I have met with three cases in which a very  
useful foot has been obtained after removal of the  
astragalus, and in which the false joint between the  
os calcis and the bones of the leg admitted of a con-  
siderable amount of flexion and extension; while in  
instances in which the os calcis has been dissected  
out, though the prominence of the heel is lost, and  
the limb is shortened so that the malleoli occupy a  
lower level than natural, good flexion and extension  
remain, and, when the necessary addition to the  
thickness of the heel of the boot is made, the patient  
walks with scarcely any appreciable defect.

There can be no hesitation in allowing that an  
admirable stump is obtained by Syme's amputation.  
Yet the loss of a foot must always be a serious mutil-  
ation; and certainly if the treatment which I have  
just described, and which has been so strongly urged  
by Mr. Holmes, and other authorities, is brought to  
bear, the removal of the foot can in a very large pro-  
portion of cases be avoided.

**Acute suppurative arthritis.**—Whether origi-  
nating in some form of blood poisoning, in the ex-  
tension into the joint of mischief in one of the con-  
tiguous bones, or, as I have twice seen, in acute  
inflammation following prolonged exertion of a joint  
that had previously been unsound, acute suppurative  
arthritis of the ankle is characterised by severe pain,  
rapidly increasing swelling, redness of the skin, and the  
constitutional disturbance and fever which accompany  
these local symptoms. The formation of pus is in-  
dicated by increase of swelling, and pain by a further  
rise of temperature, often by rigors, and by the  
ance of œdema and pitting of the surface  
The treatment is that laid down for ac

page 17. Should it be believed that the joint has become disorganised, should discharge continue profuse, should the temperature remain high, and should the patient be losing in general condition, Syme's amputation had better be at once performed, not only because it may be dangerous to the patient's life to postpone active interference, but because there is no prospect that, even if the foot can be preserved, the limb will be more useful than will be the case when the well-formed stump left after amputation shall have been secured.

**The acute arthritis of infants.**—This affection (page 127) presents no features in the ankle joint that call for detailed description. It runs its course quite as rapidly here as elsewhere, and unless active measures are at once adopted, the joint, together with the lower end of the tibia and fibula and the tarsal bones, will be destroyed. A case is mentioned at page 143 in which such complete disorganisation had occurred that though the parts had healed amputation was necessary. Early evacuation of matter, however, with subsequent rest and antiseptic dressing will, when other joints are not involved, and when the general strength remains good, often lead to complete repair.

**Osteo-arthritis.**—Not so frequent here, as in many of the other joints, this disease is still occasionally met with. The ankles are usually both affected, and the nature of the case is generally disclosed by the presence of the malady in other joints. The symptoms are stiffness, weakness, and pain in the articulation, attended with swelling, and very soon with a disabling and very intractable form of flat foot, due in part to weakness of the muscles, but largely to the fact that all the ligamentous structures on the sole become involved. In many instances talipes valgus is also developed.

*Treatment.*—The general management of these



cases is given at page 68 *et seq.* As for local means, the patient must be directed to be on his feet as little as possible, especially when the disease is in a period of exacerbation, and to take the opportunity of sitting instead of standing whenever he is able to do so. He should be supplied with boots made of soft leather, and large enough to allow for variations in regard to swelling. Some patients, however, can only wear loose cloth boots. An outside iron with T strap, such as is used for ordinary flat foot, will be serviceable in patients not much past middle age; but in elderly persons whose muscles are weak, the extra weight of this apparatus is an objection to its employment. Relief from pain may be secured by temporary rest, blistering, and the use afterwards of hot bathing. Passive movements, during which the foot is carried up well within a right angle, will prevent stiffness, and do something also to arrest muscular wasting.



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